

Mental health in the working world

Determining the current state of scientific evidence

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Foreword

Change in the working world poses great challenges for society. For some time now, the issue of the effects and the design of mental load factors has been drawing particular attention at the company level.

Therefore, a shared objective of the different actors in the fields of occupational health and safety is to integrate mental load, according to the relevance of the issue, into occupational health and safety systems and approaches and to continue their development. In addition to the many operational activities regarding occupational safety in and across businesses, the regulatory specifications within the scope of the Working Conditions Act – accompanied by an intensive discourse on potential regulatory gaps (“Anti-Stress Ordinance”) – as well as the work programme of the Joint German Occupational Safety Strategy (GDA) and the joint declaration by the Federal Ministry of Labour and Social Affairs (BMAS), the Confederation of German Employers Associations (BDA) and the German Trade Union Confederation (DGB) are worth mentioning here.

With the results of the project “Mental health in the working world – Determining the current state of scientific evidence”, the BAuA provides a compilation of the available current state of scientific knowledge and, based on this, options for action for continued development of occupational health and safety for the political discourse on occupational safety.

In the context of the debate on mental health, the notion of “mental load” has become widely used by the media and the public and has established itself as a term not only in practice, but also in the various work-related scientific fields. However, it is not always understood in the same way and is used to denote different work-related attributes.

The present report is based on a systematisation of work-related mental load factors into four thematic blocks, namely task-oriented requirements, the physical and technical work environment, aspects of working time design as well as the social and organisational factors of work. A fundamental idea in our approach was to consider health comprehensively, i.e. not only as the absence of illness, but also positively in the sense of well-being. The analysis of the complexity of the interdependencies focusses both on impairing aspects in terms of “stress factors” and on beneficial aspects in terms of “resources”. For a research project aiming to provide an overview of the current state of scientific evidence regarding mental health in the working world, this means a methodical approach which takes into consideration the aforementioned aspects.

The review of scientific knowledge is based on the method of “scoping reviews”. As a result, the associations between more than 20 work condition factors in terms of psychological problems, muscular-skeletal and cardiovascular illnesses, general health and well-being, symptoms and performance could be described and analysed. The scientific findings show that the individual working condition factors are of varying importance for the design and that they also serve different design objectives. For instance, work intensity is a key stress factor; however, this should not be understood in a way that defines its minimisation as a design objective. On the other hand, latitude for initiative has been shown to be a central work-related resource. This suggests an extension of the perspective of occupational safety, which should no longer aim for the reduction of stress factors, but for an adequate optimisation, and should in addition focus on establishing and promoting work-related resources.

These findings show that the use of work-related resources is subject to certain requirements. The utilisation of work-related resources also requires design skills of managerial staff and employees, in particular addressing qualification and preventive behavioural measures in addition to a focus on situational prevention. Providing employees with the option to influence the design of their working tasks promotes the development of skills which are important for the future due to an increasing variability of working conditions, e.g. in the context of digitalisation. Both sufficient latitude for initiative and skills for their utilisation must be communicated for this purpose.

Working on this topic has shown us that, due to the variety and complexity of the issue of the “working world”, the scientific findings and their consequences for design require both a specialist scientific debate and an expert-focussed discourse in the field of occupational health and safety as well as in practice. These debates and discourses formed an integral part of the project. It was our aim to outline design approaches and to identify options for the continued development of occupational health and safety.

The character of scientific work means that it can both provide in-depth knowledge and identify unresolved issues which may require new instances of discourse. This also holds true for our project – it provides results, but it has also triggered intense, sometimes controversial debate. In this regard, we hope to be able to continue the important dialogue with our partners and contribute together to the continued development of safety and health in the workplace.

We would like to thank all those who contributed to this process. In particular, we would like to thank the members of the committee of the Scientific Advisory Board of the BAuA, who have assisted the project with their expert advice from the beginning. In the same way, the members of the Board of Trustees of the BAuA have supported the project from the beginning and have offered the backing of experts and policy-makers at the juncture with occupational safety practice. Last but not least, the BAuA employees involved have jointly contributed their skills and motivation to the project over a longer period and, in doing so, have enabled this ambitious undertaking to become a reality.

1 Background, objectives, methods and project organisation

1.1 Background

The working world is continuously changing, which is evident e.g. from the increasing demands regarding flexibility and mobility of employees. Besides this, the work itself is also changing, i.e. it is becoming more varied, more complex and to some extent also more intensive. For instance, the introduction of new leadership concepts based on agreement of objectives has resulted in stricter planning and management requirements for employees (Rothe & Morschhäuser, 2014). In addition, businesses react to crises sooner and faster by implementing restructuring measures (Schütte & Köper, 2013). Moreover, it must be assumed – based on the future scenarios described in the context of the Industry 4.0 concept – that the communication and cooperation of humans and machines will intensify (Kagermann, Wahlster & Helbig, 2013).

The developments described above also entail a shift in actual work requirements, as the number of activities predominantly involving cognitive, informational and emotional factors has increased and is expected to rise further.

Against the background of an increase in sick leave days and disability benefits due to mental and behavioural disorders, mental health in the working world has become more and more important and is also widely discussed in public.

As a matter of principle, the changes in stress arising in the context of changing working conditions and the new working conditions resulting from them should also comply with the criteria for humane work. For instance, an activity is considered humane if it does not impair physical and mental health, well-being and productive capacity, matches the existing qualifications of the employee and permits development of individual potentials and skills (Gesellschaft für Arbeitswissenschaft [Society for Occupational Science], 1999). Fulfilling these demands requires comprehensive familiarity with the available knowledge about mental load, in order to be able to build on this knowledge by deriving options for the design of work, i.e. both activity-related and regulatory options. So far, however, a comprehensive overview of the available state of knowledge has been lacking. This concerns the factors of working conditions, their manifestations and measurement, the specific consequences of stress, the design approaches, a suitable analysis of the new employee requirements against the background of changes in the working world, and the process knowledge for good and sustainable workplace design practice. This also includes the identification of knowledge deficits and the initiation of research in order to close any existing knowledge gaps.

Criteria of humane work design

1.2 Project objectives

Accordingly, the project “Mental health in the working world – Determining the current state of scientific evidence” aims to gain knowledge on how to assess mental load factors in terms of the available verified state of scientific knowledge, which new work requirements result from changes in the working world and which knowledge gaps exist regarding load constellations, their development contexts and their impact on individuals. The process is intended to include the determination of essential design topics and the available design knowledge, while also highlighting existing research gaps. Following the model of humane work, this should mean not only considering potential hazards, but also features of work promoting personal development and health (see also Schütte & Windel, 2017).

Specifically, systematic overviews (scoping reviews) have been prepared for significant mental working condition factors providing information on

- (a) how the mental load factors are defined,
- (b) which measurement methods are applied in order to detect them,
- (c) which relationships exist between mental load and mental health,
- (d) to what extent the existing studies take into consideration the changes in the working world,
- (e) what knowledge of design is available, and
- (f) where unresolved research questions exist, which can then be transferred to a medium to long-term research agenda.

The determined state of scientific knowledge is intended to form the basis for the derivation of options for action in the fields of occupational safety, workplace health promotion, labour politics and worker participation, as well as to provide suggestions for neighbouring political fields, such as occupational safety, healthcare or further education across all businesses. This also requires an analysis of the significance of the available design knowledge. Analysis of the literature therefore involved a broad-based search, meaning that not only studies specifically focusing on the review of design solutions, but also studies treating e.g. the context of working conditions, the constellations of their occurrence and the changes affecting them have been included. Accordingly, a distinction is made – depending on scientific evidence – between design knowledge, design recommendations and design information.

Design knowledge,
design recommendations
and design information

- The term “design knowledge” is used to designate verified design derivations which are based on interventional studies and studies of similar quality. The informative value of these design statements is accordingly high.
- In comparison, design recommendations are direct derivations for practical application resulting from the outcome of studies, e.g. by means of empirically based associations, without a specific verification of the design statements.

- Design information constitutes conclusions reached by the authors which, although referring to the findings reported in the studies, are not derived on the basis of empirical scientific evidence, but are presented rather as argumentative derivations. It therefore represents the weakest form of design statements.

1.3 Key terms and concepts

1.3.1 Working condition factors

For a selection of some of the many existing working condition factors which represents a good sample, but also focusses on essential key aspects, a selection strategy consisting of three steps was developed. Consequently, the project (1) considered working condition factors of high scientific significance representing key components of occupational science and/or occupational psychology theories and models, such as those featured by the job demand control model (Karasek, 1979; Karasek & Theorell, 1990; expanded in Johnson & Hall, 1988), the activity regulation theory (e. g. Hacker, 1980; Volpert, 1987; Hacker & Sachse, 2014; cf. Rau, 2015), the job characteristics model (Hackman & Oldham, 1975), the job demand-resources model (Demerouti, Bakker, Nachreiner & Schaufeli, 2001), the demands-induced strain compensation model (de Jonge & Dormann, 2003) and the effort-reward imbalance model (Siegrist, 1996a, 1996b). Also considered were (2) such factors which are currently the focus of political debate on mental health and are addressed e. g. in draft versions of regulations, agreements or manuals (Federal Ministry of Labour and Social Affairs, Confederation of German Employer Associations & German Trade Union Confederation, 2013; Bundesrat, 2013; IG Metall Vorstand [Directorate of the German Metalworkers' Union], 2014; Directorate of the GDA Work Programme on Mental Health, 2014), or (3) have attracted much public attention (“Die gestresste Seele” [“The stressed-out soul”]: Der Spiegel, 2012; “Generation Burn-out”: Focus, 2013).

Theories and models of work science and work psychology

The 20+ working condition factors determined by this approach were grouped into four subject areas based on the so-called MTO model (human, technology, organisation; Ulich, 2011): working task, leadership and organisation, working time and technical factors. For a summary of the considered working condition factors see Figure 1 below.

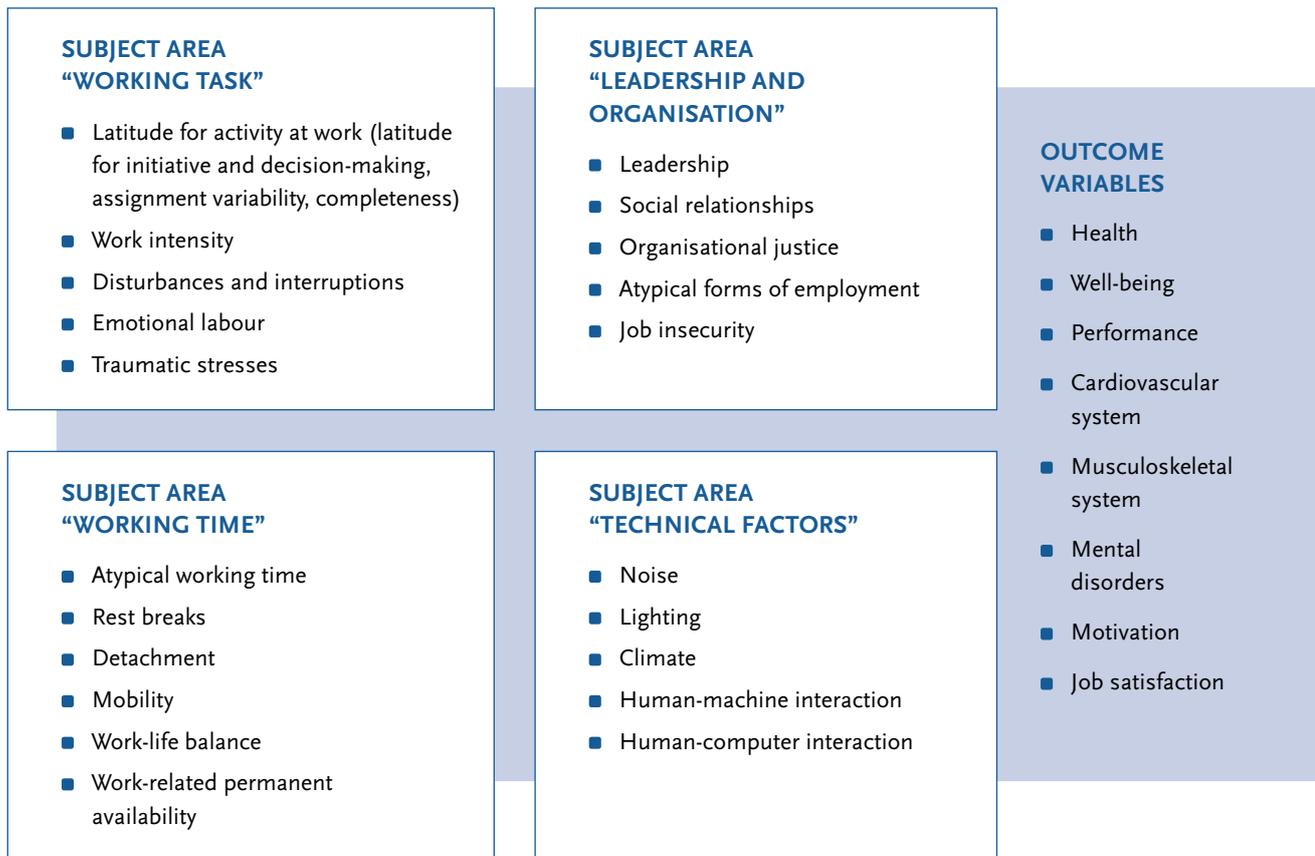


Fig. 1 Working condition factors and outcome variables considered in the project, sorted by subject areas

1.3.2 Mental health: Selection of outcome variables

Comprehensive understanding of health

Health is not only the absence of illness or infirmity, but also overall physical, mental and social well-being (WHO, 1946) as an essential requirement for the ability of human beings to function and to engage in gainful employment (Pech, Rose & Freude, 2010; WHO, 1946). In addition, the human-related mental work requirements must be differentiated into short-term and long-term, as well as positive and negative effects (DIN SPEC 33418:2014-03).

Current public debate on mental health, however, focusses mostly on the negative long-term consequences of mental work load, i.e. impairment of health, which is probably caused by the rising number of disability benefits granted due to a mental disorder as well as the increase in sick leave days. From 2000 to 2014, the number of disability benefits granted due to a mental disorder has risen from approx. 50,000 to almost 75,000 (Deutsche Rentenversicherung Bund, 2014). In addition, the share of mental disorders among all causes of sick leave days is approx. 15% (DAK, 2013). In addition, other psychosomatic disorders, particularly cardiovascular diseases, are considered as being triggered in part by the mental load (Siegrist, 2014a): For instance, mental load increases the risk of cardiovascular disease associated with arteriosclerosis (Backé, Latza & Schütte, 2012; Siegrist & Siegrist, 2014). For back pain and other symptoms of the musculoskeletal system, psycho-social aspects of work life are also reported

as significant in the context of complex and multi-dimensional aetiology (Seidler, Liebers & Latza, 2008; Siegrist, 2014b).

Following the comprehensive understanding of health described above, the consequences of mental load related to well-being must also be considered; whereby short-term negative effects, such as experiencing fatigue, or short-term positive effects, such as motivation, should be considered in the same way as long-term positive consequences, becoming evident in job satisfaction, or long-term negative effects, manifesting themselves e.g. in psychosomatic symptoms.

For this reason, a survey of the effects of mental load must involve several different levels: Consequently, aspects to consider are mental disorders as well as cardiovascular and musculoskeletal disorders, but also psychosomatic disorders, subjective well-being as well as job satisfaction and motivation (cf. Figure 1). It must also be considered that the consequences of mental work requirements are subject to the individual characteristics of employees (e.g. age and gender) as well as intensity, type, duration and timing of the load.

1.4 Methods

1.4.1 Employee surveys

On the basis of the working time reporting (BAuA, 2016), computer-assisted telephone interviews (CATI) conducted during the period from May 2015 to October 2015, the relevant prevalences were calculated to gain insight into the prevalence of the selected working condition factors. The questionnaire forming the basis of the CATI contained items referring to working condition factors associated with the subject areas “Working task”, “Working time”, “Leadership and organisation” as well as “Technical factors”. The sample consists of a total of 18,224 individuals, all of them employees, with 53% of them male and 47% of them female. Of all participants (n = 18,224), 51% are 44 years old or younger (15–24 years: 6%, 25–34 years: 22%, 35–44 years: 23%), while 48% are aged between 45 and 64 years (45–54 years: 30%, 55–64 years: 18%) and 1% are 65 years or older.

Prevalence of working condition factors

1.4.2 Qualitative study of workplace practices

A qualitative study was additionally conducted, aiming to establish an overview of the relevance of the issue of mental load in workplace practice, to gain additional insight on the conditions and forms of workplace perception, addressing and handling of mental work requirements. To this end, 16 external experts specialising in prevention consulting were interviewed (10 males, 6 females; 5 occupational safety specialists, 6 company physicians, 5 other prevention consultants not falling under any definition of the Occupational Safety Act; 9 of them employed with a supervisory body, 7 of them self-employed), having worked with a total of approx. 220 businesses in a wide variety of sectors and sizes. In partly structured interviews supported by a manual and lasting 90 minutes on average, the following four subject areas were discussed: (1) Information on the interviewee (gender, qualification, professional capacity, professional experience, form of employment, scope of consulting work);

Workplace perception, addressing and handling of mental work requirements

(2) workplace stress situation from the perspective of the interviewee (forms of mental load and their prevalence; potential increases in prevalence in particular sectors and business sizes; development trends; background/causes of stress; observable individual consequences); (3) workplace perception and addressing of mental load (degree of sensitisation; main areas of focus; assessment scales; conditions and occasions; obstacles and conflicts; actors; function of occupational safety; role of risk assessment); and (4) practical handling of mental load by businesses (type and scope of measures; association with mental load; impact on selection and implementation of measures; favourable and inhibiting factors; internal debate; mobilised design knowledge; roles of the different actors; scope of action, initiatives and effectiveness of the professional occupational safety experts).

1.4.3 Selection of method for literature preparation

Various established procedures exist for the analysis and preparation of literature, involving the gathering, assessment and description of the state of scientific knowledge in the form of literature overviews. The range of existing approaches includes (a) traditional literature overviews, in which theories and hypotheses are assessed on the basis of existing primary studies; (b) conceptual reviews offering a synthesis of the knowledge available for a subject or problem; (c) systematic reviews identifying the empirical scientific evidence on the basis of pre-determined selection criteria; and (d) scoping reviews, a type becoming more and more prevalent (Arksey & O'Malley, 2005), utilising various publication formats to describe the state of available knowledge on a subject in order to document what is currently known, specify research questions, concepts and theories and derive a research agenda (cf. Jesson, Matheson & Lacey, 2011).

Scoping review

Of the four approaches outlined, the scoping review distinguishes itself by the absence of any special requirements regarding the methods applied in the studies. As a consequence, this approach permits a broad description of the available scientific evidence, which seems generally useful as the choice of method usually follows the research question (e.g. Patton, 2006), rendering the requirement of specific research designs obsolete. For instance, limiting the literature search to randomised controlled trials (RCTs) would entail the disadvantage that literature on such working condition factors for which RCTs cannot be conducted for ethical, legal or also for conceptual reasons would not have been considered. Although e.g. cross-sectional studies cannot provide any evidence of certain causalities, as they only permit statements on the covariations between the registered variables, they do deliver important indicators of potential cause-and-effect associations and therefore are another significant source of knowledge. In addition, this method offers the advantage of allowing a decision, based on the extracted literature, whether the state of scientific knowledge permits further evaluation, such as meta-analyses. In addition, a scoping review also permits considering such subject areas which are still in their nascent stage and therefore do not feature a long history of research, or including studies which do not explicitly focus on work design. Based on these considerations, the method of the scoping review was selected for uniform processing of all working condition factors.

Work steps of a scoping review

From a formal point of view, the performance of a scoping review requires six successive work steps (Arksey & O'Malley, 2005; Jesson et al., 2011). To begin with, (1) the research question is defined, which provides a point of orientation for (2) the systematic search for publica-

tions with a relevant contents, i.e. addressing the research question. For this purpose, step (3) specifies selection criteria for the inclusion and exclusion of articles, without any central importance of methodical features (e.g. study design, use of quantitative measurement methods, etc.) as opposed to other forms of systematic reviews. The next step (4) involves the development of a so-called extraction scheme, which provides the basis for excerpting the findings and data described in the individual publications. This is followed by (5) the structuring, summarising and presentation of the results. The final step (6) consists of discussing the state of knowledge resulting from the review with stakeholders important for the issue (such as scientific experts, actors of occupational safety and health) in order to obtain additional information and/or indicators of other points of view, but also to gain insight on how to apply the findings (Levac, Colquhoun & O'Brien, 2010).

1.4.4 Performance of scoping reviews

The first step consisted of formulating a general research question, from which the features to consider in the development of a search strategy would result, such as the population for analysis (e.g. employees), the independent and dependent variables to include (e.g. load factors, stress indicators), the relevant publication period etc. Based on this specification, which generally applied to each working condition factor, the research question was then incrementally adapted to the specific issue to address in detail:

Development of the research question

“What is the impact of the working condition factor(s) the scoping review focussed on – in consideration of age and gender if possible – on health, well-being, performance, the musculoskeletal system, the cardiovascular system, mental disorders, motivation and job satisfaction?”

So-called search strings were developed for the search for publications with relevant contents, e.g. in electronic databases, bibliographies of publications, conference transcripts, key journals or also in pertinent networks and organisations. The development of the search strings for the individual scoping reviews was based on the theories, models and concepts available for the particular working condition factors. Besides this, published search strings – such as the one by Mattioli et al. (2010) – were also applied in order to limit the literature search to the context of work. On the one hand, the literature search was conducted in existing databases (PsycINFO/PsycARTICLES, PSYINDEX, SCOPUS, PubMed, Web of Science, WISO), with the title, abstract, keywords, and partly also the full text of the articles being reviewed for compliance with the pre-determined search items. On the other hand, manual searches were also undertaken in relevant scientific journals, conference transcripts or the reference lists of the included manuscripts.

Development of search strings

Inclusion and exclusion criteria were specified on the basis of the insights gained while reading the publications. Selection was further carried out by at least two reviewers, deciding independently whether the individual publications should be considered further. For almost every working condition factor, the literature search resulted in a very large number of hits, making it necessary already at a very early stage of the project to define criteria for both the further specification of the search strings and the later inclusion or exclusion of manuscripts. Language was selected as a first inclusion and exclusion criterion for all scoping reviews: The scoping reviews should only include manuscripts in German or English. In addition, articles

Inclusion and exclusion criteria

were excluded from further processing if major uncertainties arose from the description of the study, i.e. if the operationalisation of the variables was unavailable or impossible to trace, or if the representation of the methodical approach, the measurement instruments used or of the results was incomplete. Besides this, articles which were no longer relevant were not considered, e.g. if technological progress had changed the applicable working condition factor to an extent not yet considered in the publication in question.

Quality assurance For quality assurance of the decision processes necessary in the preparation of the scoping reviews, at least another reviewer was involved in addition to the person in charge of the review; this second reviewer was then tasked with (1) the selection of the abstracts to be included for further, more detailed reading, (2) the decision on inclusion or exclusion of manuscripts, and (3) the extraction of data from the included manuscripts. In addition, the conducted literature search and the decisions on inclusion and exclusion of manuscripts for all scoping reviews were carefully documented.

1.4.5 Assessment of findings

Levels of significance and effect size metrics The indication of the level of significance of the obtained results commonly included in quantitative scientific studies to assess findings leaves one important aspect unconsidered, namely the aspect of the relevance of the knowledge gained. So-called effect size metrics can provide clues on the practical importance of the findings described in the studies. Ferguson (2009; see also Ellis, 2010) differentiates between effect size indicators for association metrics, group distinctions and risk estimates.

Association metrics The correlation coefficient (Pearson's r) is a direct measure of effect size and is probably one of the most common parameters among association metrics. The assessment of the size of an effects was based on the classification scheme proposed by Cohen (1962, 1988), which differentiates between small ($|r| = 0.1$), medium ($|r| = 0.3$) and large effects ($|r| = 0.5$). So-called adjusted metrics including an error adjustment in general or taking into account the common variance of the considered variables also exist for the correlation coefficient (Ferguson 2009). However, using such parameters makes the comparison of different studies more difficult, as the correction is commonly applied to different tertiary variables. For this reason, it is useful to report unadjusted correlation coefficients.

Measures of group differences A common dimension for effect size in the context of the assessment of group differences, i.e. of mean differences, is Cohen's d , which can again be subdivided according to Cohen (1962, 1988) into the categories small ($|d| = 0.2$), medium ($|d| = 0.5$) and large ($|d| = 0.8$).

Risk estimates Risk estimates are also commonly used as a measure of effect size; they are primarily calculated for dichotomous outcome variables and also represent group differences. Two commonly used estimates are relative risk (RR) and the odds ratio (OR). If RR and OR have the value 1, the risks and chances in the groups (e.g. exposed and non-exposed persons) are equally high. For values > 1 , there is a higher risk/a higher chance of e.g. an illness occurring in the exposed group; for values < 1 , the risks/chances in the exposed group are smaller.

The individual effect size metrics can partly be merged with each other (Cohen, 1988). For instance, a correlation of about 0.2 – indicating a small effect – corresponds to an odds ratio of approx. 2.0, i.e. the probability of developing a disease is twice as high (cf. Borenstein et al., 2009). This example shows that even small correlations should not be interpreted as irrelevant. For this reason, a rigid application of classification systems such as Cohen's (1988) is discouraged and an interpretation based on the effect sizes common in the field of research is recommended (Fröhlich & Pieter, 2009). The evaluation of studies in the field of applied psychology yielded a effect size median of 0.16 (Bosco et al. 2015), which again shows that small effect sizes need not be meaningless per se. In addition, the interpretation of effect sizes should consider that working condition factors do not occur in isolation, but are always part of load constellations and can therefore have cumulative effects.

Application of classification systems for effect sizes

An important parameter for the assessment of the quality of measurements is the reliability coefficient, which can take numerical values between 0 (entirely unreliable) and 1 (entirely reliable), with DIN EN ISO 10075-3 requiring a minimum measurement precision of 0.7. Overall, the majority of the survey procedures applied in the studies complies with this level of reliability.

Assessment of measurement quality

The results were discussed with scientists experienced in the respective subject areas, whose remarks and suggestions were then applied in the revision of the reviews to ensure that the literature prepared as described above and the conclusions on knowledge gaps and on the research agenda derived from it can achieve a consensus in the scientific community.

Discussion of findings with selected scientists

1.5 Project organisation

The project started in 2014; it was planned to run for approx. three years and was subdivided into three phases, with the latter phases building on the former. A committee of the Scientific Advisory Board of the BAuA provided in-depth specialist consulting to the project. For a list of members of the committee see Annex A2. Phase I included the analysis of the available knowledge, as described above, using methodically stringent and content-based literature reviews focussing on the association between individual working condition factors and the mental health of employees.

Analysis of available knowledge

Phase II began in late 2015, when the scientific expert discussions with scientists experienced in the respective subject area were conducted. The objective of these meetings was to achieve a consensus on the current state of knowledge based on the available literature reviews. Between December 2015 and February 2016, six expert discussions on the subject areas "Working task", "Working time", "Leadership and organisation", "Technical factors" as well as on comprehensive topics, namely "Design approaches" and "Mental health" were held.

Scientific expert discussions

To discuss the findings, the BAuA invited renowned experts from national and international universities and research institutions to attend the events, which were held over the course of two days. The entire process was supported by the committee of the Scientific Advisory Board of the BAuA. For an overview of the experts invited see Annex A2. Prior to the discussions, the external experts were asked to remark on the scoping reviews prepared during the first project phase. Like the expert discussions themselves, these remarks provided substantial input for

the subsequent revision of the scoping reviews. On the other hand, the expert discussions focussed on issues from the respective subject area, e. g. on interdependencies of working condition factors, design options and the relevance of the issues in a changing working world.

The members of the committee of the Scientific Advisory Board of the BAuA were closely involved in the preparation and the execution of the expert discussions, assuming the roles of “mentors”. Already during the preparation of the scoping reviews as well as in the expert discussions, they provided the authors with important impulses, particularly regarding the research agenda.

Discussion of findings
with experts in the relevant
practical fields

The expert discussions were followed by an intensification of the discourse with the scientific community through the presentation of the literature reviews at key scientific conferences (Society for Occupational Science, German Society for Occupational and Environmental Medicine and German Society for Psychology).

In the third and final project phase – from June 2016 onward – the BAuA discussed the insights gained with experts in the relevant practical fields, primarily working in occupational safety, and with representatives of the social partners in order to identify operational implementation options in the field of occupational health and safety. A joint session of the Board of Trustees of the BAuA – featuring the social partners, the health insurances, the federal states and the professional associations – and the committee of the Scientific Advisory Board marked the starting point of the debate.

This was followed by a continuation of the discussions with occupational safety actors and stakeholders in order to present the scientific knowledge acquired in the project phases I and II to central workgroups and forums. These discussions involved specialised institutions such as the Confederation of German Employer Associations, the German Trade Union Confederation, the National Occupational Safety Conference, the Commission for Occupational Safety and Safety Engineering of the Federal States, and the Initiative “New Quality of Work”. Phase III therefore focussed on the derivation of potential recommendations for action regarding mental health as well as on the transfer of the results to the occupational safety community. For a summary of the results of the stakeholder discussions, which have also been included in the BAuA Recommendations, see Chapter 4.3.

A final conference on 5 May 2017 completed the project “Mental health in the working world – Determining the current state of scientific evidence”.

2

Project findings

2.1 Fundamental insights

2.1.1 Stress factors and resources

In summary, the scoping reviews show that many of the considered working condition factors can be classified either as stress factors or as resources due to their typical effect; this classification is found not only in occupational science models such as the job demand-resources model (Demerouti, Bakker, Nachreiner & Schaufeli, 2001), but also in existing health models. For instance, so-called risk models of health primarily focus on stress factors which can increase the likelihood of diseases. In contrast, psycho-social models, and in particular salutogenetic concepts, emphasise factors considered to be health-promoting, i.e. resources and protective factors. A stress factor is associated with physiological and/or mental costs, complicates reaching the work results expected by businesses, or exceeds the abilities of the employee. In contrast, a resource is instrumental to achieving goals, reduces costs, stimulates personal development and can reduce the effect of stress factors (cf. Demerouti et al., 2012).

Stress factors and resources

It should be considered, however, that the different factors do not occur in isolation, meaning that this monocausal view must be complemented by a perspective taking into account the entire load constellation. For instance, high work intensity often occurs concurrently with frequent disturbances and interruptions. In most cases, different factors therefore have an impact beyond their role as an independent stress factor/resource, and this in various constellations and complex associations. Generally, two types of combined effect can be distinguished, namely cumulation and compensation of load: In case of cumulation, the simultaneous occurrence of different factors and their interaction increase the individual detrimental consequences for load and health. If, for instance, high work intensity or high emotional labour demands are accompanied by long working hours and certain expectations by the company on reaching objectives, it is probable that these load factors will accumulate with regard to their negative impact on recovery options and mental health (additive effect) or may even be amplified (supra-additive effect).

Load constellations

Cumulative effects

Besides this, however, compensatory effects of working conditions on mental health can also be observed. Resources can reduce the negative impact of certain stress factors or change their character, e. g. if the possibility of designing one's own work permits changing not only the intensity, but also the timing and the distribution of stress factors according to one's own terms. While interruptions, for instance, generally represent a stress factor, available degrees of design could be utilised in order to create periods during which the working task can be

Compensatory effects

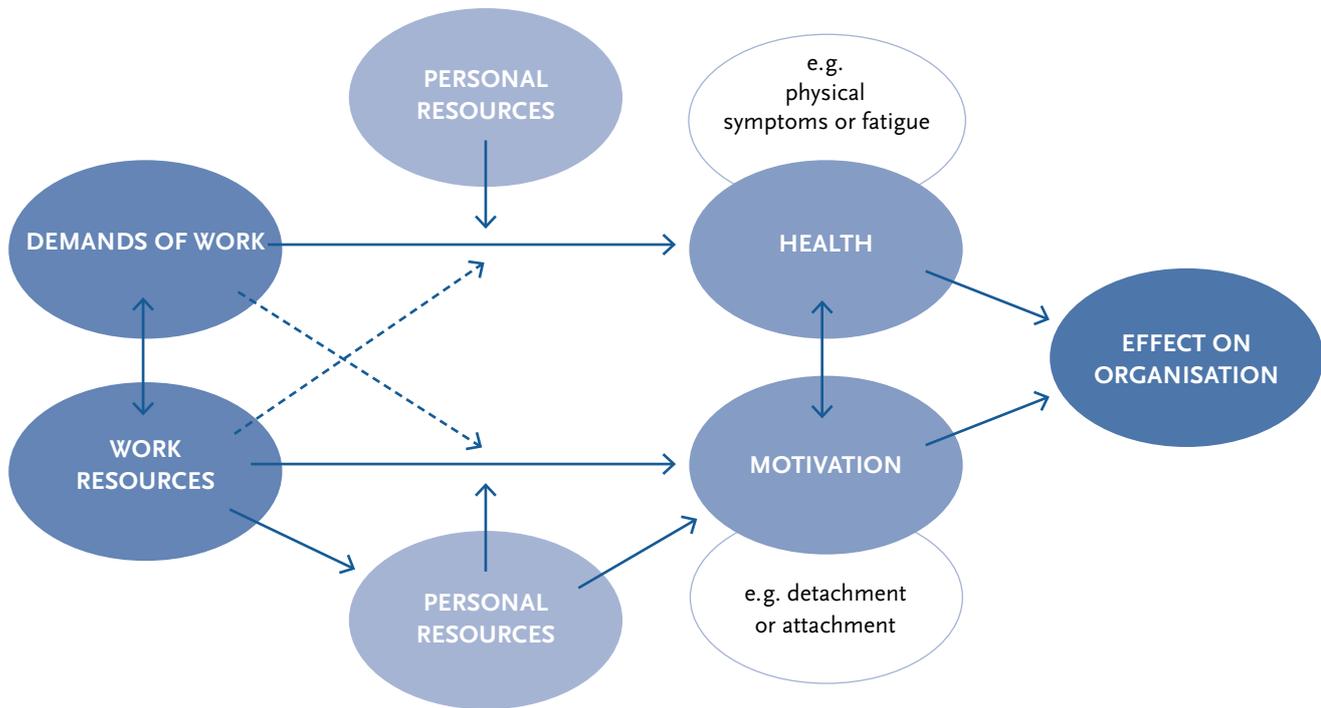


Fig. 2 Effect of stress factors and resources according to the job demand-resources model (based on Demerouti et al., 2001)

performed without being disturbed. The general effects of stress factors and resources based on Demerouti et al. (2001) are illustrated in Figure 2.

For various demands, it must be assumed that exceeding a certain level – independently of all other working conditions – entails a negative impact on mental health. For instance, continued long working hours preventing recovery cannot be entirely compensated by potential resources, such as scheduling autonomy. The same applies to permanent noise due to talking in an open-plan office, which in the long term will make concentrated or interactive work massively difficult, even if certain freedoms of design are provided.

Positive effects and impairment

Regarding the impact of mental load factors on health, it must be distinguished in general whether the utilisation of the physical, cognitive and emotional resources of an individual entails positive (e.g. meaning of work, self-efficacy) or negative (e.g. experiencing difficulties, impairment, loss of purpose) consequences (cf. Figure 3). In the positive case, training and learning effects can occur in the short term, with changes in work motivation in the medium to long term. In case of negative effects, fatigue or fatigue-like symptoms are imaginable in the short term or – if the effects remain in the medium term – difficulty relaxing (brooding/rumination, anticipation of stress). In these situations, work design must contribute to enabling recovery, otherwise it cannot be excluded that personal resources cannot be re-established or that they remain weakened. In the short term and possibly even in the medium term, this may not cause any problems for the mental health of employees. If the effects continue over a longer period, however, and the personal resources or abilities are weakened permanently, an impairment of health is probable (cf. Figure 3).

Short, medium and long-term effects

It must be considered in this context that factors also have an indirect impact on the association between working conditions (stress factors and resources) and mental health, such as detachment and work-life balance. For instance, long working hours or high emotional demands will make mental detachment more difficult. On the other hand, the option of choosing one's own working time will favour a good work-life balance. Both work-life balance and detachment will in turn have a significant impact on various components of the mental health of employees. Generally, manifestations of the working condition factors, based on different theoretical models (e.g. the homeostasis model, the allostatic load model, the conservation of resources theory and the transactional stress model), are assessed as critical for health if they lead to permanently increased effort for the organism, a medium-term excessive demand for individual compensation, or substantially negative activation.

Manifestations of working condition factors of critical importance to health

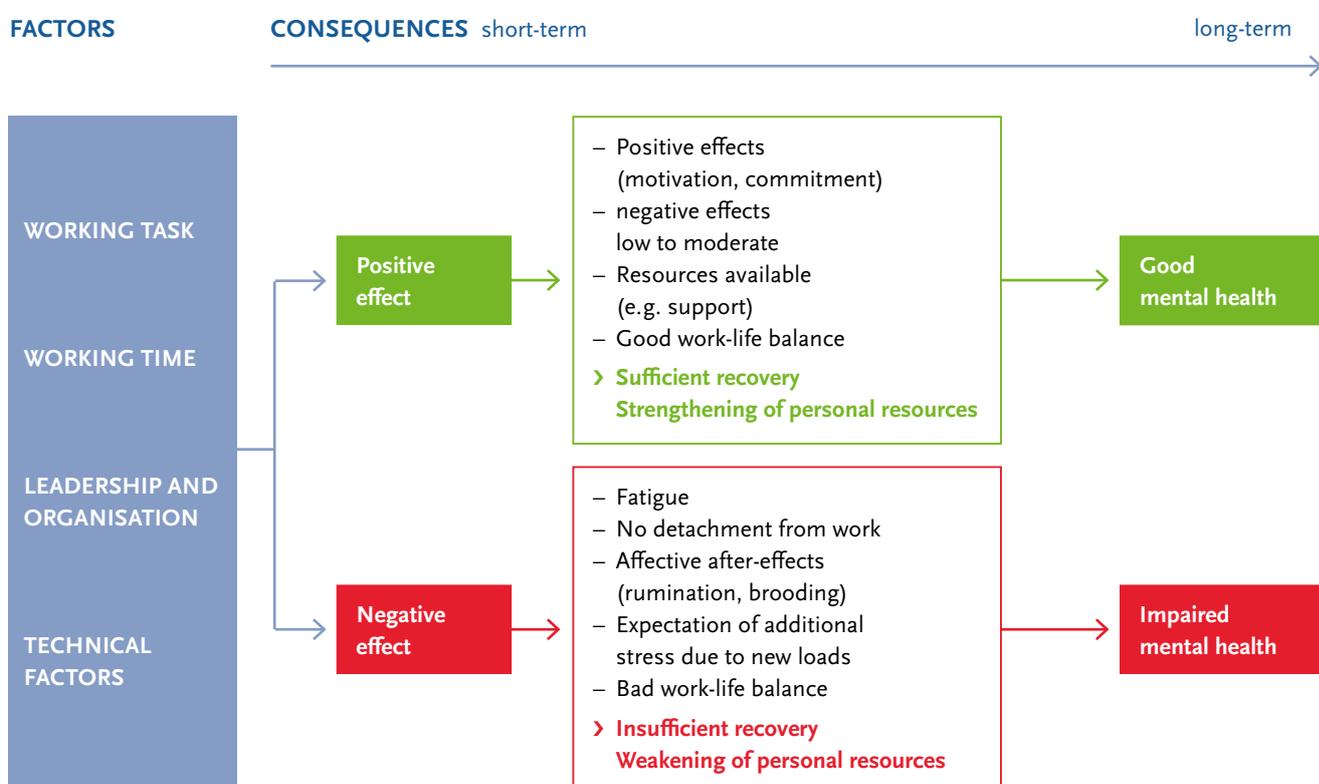


Fig. 3 Fundamental assumptions regarding the effect of working condition factors on mental health

2.1.2 Key factors

Factors with systemic impact

Due to the number of influencing factors in a work system and the potential interaction between them, solving design problems can become a multi-layered, almost inextricable task, making it seem useful to subdivide the design task into manageable, easier to handle sub-issues. For the optimisation of complex stress situations, an approach can be applied in which the factors are classified as “active”, “passive”, “critical” and “slow” depending on their exertion of influence and their controllability (Hochdörffer et al., 2016). The so-called “active” factors strongly influence other factors, but can only be slightly influenced themselves. Accordingly, change measures should initially focus on such factors with a systemic effect. Specifically, such key factors can act either as a central resource or as a stress factor in instances of mental stress by enabling the employees to influence the design of their own work or by having a particularly strong inhibiting effect, depending on their characteristics. Among these factors are latitude for activity at work as a resource, as well as work intensity, emotional labour and atypical working times as stress factors.

2.2 Subject area “Working tasks”

2.2.1 Description of working condition factors

The subject area “Working task” comprises the five working condition factors (1) latitude for activity at work with the components of latitude for initiative and decision-making, assignment variability, completeness, (2) work intensity, (3) emotional labour, (4) traumatic stress as well as (5) disturbances and interruptions. In the context of literature preparation, between 3,464 (latitude for initiative and decision-making) and 7,987 (traumatic stress) abstracts were examined to determine whether they fitted the subject. The number of full texts included in the final assessment subsequently varied between 50 (traumatic stress) and 284 (work intensity) articles.

As defined in DIN EN ISO 6385:2004, a working task is “an activity or a number of activities performed by the worker/user in order to reach an intended work result”. The requirements of the working task results in the profile of regulating mental and implementing activities demanded from the employee (Hacker & Richter, 1980).

Latitude for activity at work, assignment variability, latitude for initiative and decision-making, complete tasks

Latitude for activity at work is considered a central element of task design (cf. Ulich, 2005). This includes the scope of working tasks (assignment variability) as well as the possibility to influence the course of work activities or to make decisions (latitude for initiative and decision-making). Latitude for activity at work is a central feature of humane work design and has been included e.g. in international and European standards (DIN EN ISO 6385:2004, DIN EN ISO 9241-210, DIN EN 614-2), but also in recommendations, e.g. for the implementation of risk assessment in cases of high mental load (Leitung des GDA-Arbeitsprogramms Psyche [Directorate of the GDA Work Programme on Mental Health], 2016). Another feature important for design concerns complete tasks in order to allow holistic work.

Latitude for activity at work, with its components latitude for initiative and decision-making, assignment variability and completeness, is described as an important work-related resource

in various models of psycho-social working conditions, e. g. in the job demand control model (Karasek & Theorell, 1990) or in the job demand-resources model (Demerouti, Bakker, Nachreiner & Schaufeli, 2001). Three forms can be distinguished here: “horizontal activity expansion”, which involves several, structurally similar tasks of the same skill level to be performed by the employee; “vertical activity enrichment”, which involves performing various tasks of different skill levels; and workflow characteristics including e. g. cycle time or the production principle applied in each case.

Complete, holistically structured tasks make it easier to recognise the outcome of one's own work and therefore contribute to better identification with the meaningfulness of the working task. In activity regulation theory, sequential and hierarchical completeness can be distinguished as two key aspects of the construct. A task can be described as sequentially complete if it comprises elements of planning, preparation, execution and control. The processing of hierarchically complete tasks additionally demands a cognitive performance of varying complexity, i.e. simple, automated assessment processes, but also problem-solving or creative thought processes. The aspect of sequential completeness is also found in the job characteristics model (Hackman & Oldham, 1975). In this model, the complete execution of an entire work process is called “task identity”. In addition, the “job enrichment” approach of work design intends to create complete working tasks or activities and promotes learning and personal development.

The term “emotional labour” is used to describe showing a specific emotional expression or suppressing inappropriate emotions in the context of personal activities (Hochschild, 1983). Both events with an impact on one's own emotions and workplace expectations on how to deal with customers can be triggers for emotional labour (Grandey, 2000). It is also possible that malfunctioning technical work equipment triggers negative emotions, which then need to be regulated (Grandey, 2000). The service sector in particular, in which almost 74% of employees in Germany are working (Statistisches Bundesamt [Federal Statistical Office], 2015d), increasingly involves tasks which need to be performed in close interaction with customers and require the representation of positive, negative or neutral emotions. So-called emotional dissonance develops particularly in situations where the emotion to be expressed does not match one's own mood (“emotional rule dissonance”) or when the emotion felt is not equal to the emotional expression displayed (“emotion display dissonance”; Holman, Martinez-Iñigo & Totterdell, 2008). When dealing with emotional requirements, “surface acting”, consisting of the representation of desired emotions (e. g. by adapting facial expressions and gestures) independent of experienced feelings, can be distinguished from “deep acting”, where feelings are changed (e. g. by cognitive re-interpretation) to better match the emotion required (Grandey, 2000). Overall, emotional labour has become more important with the increase in service and interactive work. Expectations regarding friendly and courteous behaviour apply to both the management level of a company and to employees in direct contact with customers, but also to employees performing basic tasks (e. g. cleaning staff, etc.). Although this means that every task involves a component of emotional labour, it is tasks in the service sector in particular that are characterised by the demand for the display of certain emotions, making emotional labour an individual characteristic. Particularly in interactive work, emotions are considered both a tool and a work object, as the employee does not only perform emotional labour, but also tries to have an impact on the feelings of customers or clients (Böhle, 2011). There is, however, little evidence available on the extent to which organisations require employees – implicitly or explicitly – to display specific emotions.

Emotional labour

Traumatic stress Traumatic stress results from events which, in accordance with DSM-IV (American Psychiatric Association, 2000), are characterised by the confrontation with an event that involves actual or threatened death, serious injury or danger to one's own physical well-being or that of others, thus representing an extraordinarily critical event with consequences for mental health. Such events can be experienced by a multitude of professions, such as police forces, firefighters, rescue teams, train drivers, bank clerks, public administrators, etc. The majority of existing studies considers either workplace measures implemented following a traumatic event, such as debriefings, or the effects of social support. It is striking, however, that there are almost no studies on the issue of the extent to which the design of working conditions can impact the risk of employees encountering critical situations, and therefore also the permanent insecurity perceived by the employees. Due to the high relevance of such measures, this issue will be discussed further under "Need for research" (cf. Schöllgen & Schulz, 2016f).

Work intensity The term "work intensity" is used by Trägner (2006) to describe the association between the three dimensions of work quality, work quantity and working time. It has been found, however, that the term is little used in scientific publications, with terms such as "job demands", "workload", "work overload", etc. being preferred. If an employee is in charge of various tasks, as is e.g. typical for modern office work, increased work intensity can arise due to the competition between time, quantity and quality-related requirements of the individual tasks. Considering the state of scientific knowledge, it appears useful to distinguish between "quantitative requirements" (comprising the aspects of workload, working time and speed) and "qualitative requirements" (comprising the complexity, difficulty and quality of work).

Disturbances and interruptions The BAuA Stress Report 2012 (Lohmann-Haislah, 2012) cites disruptions and interruptions of task performance as working conditions assessed as occurring frequently; they can have various causes, such as incoming emails, calls, etc. Generally, an interruption is understood as the temporary suspension of an activity before the purpose of the working task has been fulfilled, albeit with the intention of continuing the activity at a later time. Disruptions consist of a secondary task requiring additional effort by the employee, usually involving a loss of time. In addition, interrupted and particularly unfinished tasks will cause the employee to continue thinking about the task, therefore representing another important aspect regarding the health effects related to the performance of the task.

2.2.2 Current importance of working condition factors

Latitude for initiative In the context of working time monitoring (BAuA, 2016), the latitude for initiative was assessed with regard to 5 items, i.e. (a) independent planning and structuring of one's own work, (b) independent decision-making on time of rest breaks, (c) control of workload and (d) of task type, and (e) the requirement of following an exact specification of the workflow.

Independent planning and structuring of one's own work 73% of those interviewed stated that they can frequently plan and structure their own work, with both men and women reporting the same share (73%). In the age group of 15 to 24-year-olds, the number of employees frequently planning their own work is lower compared to the other age groups (cf. Table 1). In the following sectors, an above-average share of interviewees frequently disposes of this type of latitude for initiative: "education" (86%), "water supply; sewerage, waste management/remediation activities" (83%), "information and communication" (83%), "professional, scientific and technical activities" (82%), "electricity, gas, steam

and air conditioning supply” (79%), “other service activities” (79%), “financial and insurance activities” (77%), “public administration and defence; compulsory social security” (76%).

Table 1 Latitude for initiative. Percentage of employees stating the rating category “frequently”, by age group and total per item. Source: BAuA Working Time Report Germany 2016 (BAuA, 2016)

Item	Age Group					Total
	15–24	25–34	35–44	45–54	55–64	
Independent planning and structuring of one's own work	59	72	75	73	75	73
Independent decision-making on timing of rest breaks	53	61	63	62	58	61
Control of workload	28	33	35	35	35	34
Control of task type	22	31	35	35	37	34
Exact specification of workflow	29	28	30	30	29	29

67% of employees can frequently decide themselves when to take a rest break. At 65%, the share of men is higher here than the share of women at 56%. Again, the age group of 15 to 24-year-olds reports a lower number regarding this option than 25 to 64-year-olds (cf. Table 1). In the sectors “information and communication” (frequently: 78%), “financial and insurance activities” (frequently: 75%), “professional, scientific and technical activities” (frequently: 74%), “public administration and defence; compulsory social security” (frequently: 70%), “electricity, gas, steam and air conditioning supply” (frequently: 69%), “water supply; sewerage, waste management/remediation activities” (frequently: 65%) as well as “arts, entertainment and recreation” (frequently: 65%), an above-average share of employees can freely decide when to take a rest break.

Independent decision on timing of rest breaks

34% of those interviewed stated being in a position to frequently influence their workload. At 37%, the share of men is again larger than the share of women at 31%. As before, interviewees aged 15 to 24 years stated having this type of latitude for initiative less frequently compared to the other age groups (cf. Table 1). In the sectors “other service activities” (42%), “information and communication” (40%), “professional, scientific and technical activities” (40%) and “arts, entertainment and recreation” (39%), an above-average number of employees stated being in a position to frequently influence their workload.

Control of workload

33% of those interviewed reported being in a position to frequently influence the type of task. The share of men here is 35%, exceeding the share of women at 32%. Among 15 to 24-year-olds, the share of employees being in a position to make such decisions is the lowest, while it is the highest among 55 to 64-year olds (cf. Table 1). In the sectors “arts, entertainment and recreation” (41%), “education” (40%), “other service activities” (40%), “administrative and support service activities” (39%), “accommodation and food service activities” (37%)

Control of task type

and “information and communication” (37%), the share of employees being in a position to make decisions on task types is above average.

Exact specification of workflow An exact specification of the workflow – resulting in less latitude for initiative – needs be followed by 29% of those interviewed, with the share of men at 30% not differing significantly from the share of women (28%). There are no substantial deviations between age groups (cf. Table 1). In the sectors “transportation and storage” (43%), “manufacturing” (32%) as well as “wholesale and retail trade; repair of motor vehicles and motorcycles” (32%), the share of employees frequently required to deal with this working condition factor is above average.

On the one hand, the results prove that a large majority of the interviewees can plan and structure their work and decide when to take a rest break on their own terms, i.e. they are in control of the workflow in a large number of sectors. On the other hand, it is also obvious that only about one third of those interviewed are in a position to decide on the thematic/ qualitative and performance-related quantitative aspects of their tasks. This matches the findings that about one third of employees are frequently obligated to comply with an exact specification of the workflow. Generally, a larger share of men – as compared to women – and a smaller share of younger employees – as compared to older colleagues – disposes of latitude for initiative when working on their tasks.

Emotional labour The frequency of emotional labour was determined on the basis of the item “need to hide feelings”, and that of the emotional demands by means of the item “confrontation with other people’s problems of suffering”.

Need to hide feelings A total of 22% of the interviewees stated they frequently need to hide their feelings at work. At 27%, the share of women is significantly higher here than the share of men at 18%. In the age range of 15 to 44-year-olds, the share of employees frequently exposed to these demands is lower than the share in the age group of 45 to 54-year-olds (cf. Table 2). Above-average shares of employees can be found in the sectors “arts, entertainment and recreation” (33%), “human health and social work activities” (31%), “accommodation and food service activities” (28%), and “wholesale and retail trade; repair of motor vehicles and motorcycles” (27%).

Table 2 Emotional labour and emotional demands. Percentage of employees stating the rating category “frequently”, by age group and total per item. Source: BAuA Working Time Report Germany 2016 (BAuA, 2016)

Item	Age Group					Total
	15–24	25–34	35–44	45–54	55–64	
Need to hide feelings	19	21	21	24	23	22
Confrontation with problems or suffering of other people	29	36	37	38	40	37

Frequently being confronted with other people's problems or suffering was reported by 37% of those interviewed, with the share of women (48%) once again surpassing the share of men (27%). Overall, a lower number of 15 to 24-year-olds is frequently faced with such demands at work than the other age groups. In the sectors "human health and social work activities" (69%), "other service activities" (56%), "education" (52%), and "public administration and defence; compulsory social security" (42%), an above-average share of employees states a frequent occurrence of this working condition factor in their line of work.

Confrontation with problems or suffering of other people

2 to 3 out of 10 employees are affected by emotional labour, with more women than men and more older employees than younger ones being concerned. As expected, this working condition factor occurs predominantly in those sectors with a large share of activities requiring contact with customers and patients.

The prevalence of work intensity is determined by means of the three items "strong time constraints and pressure to perform", "need to work very fast" as well as "working on several tasks simultaneously", primarily reflecting the quantitative aspects of work intensity.

Work intensity

A total of 51% of respondents indicated frequently needing to deal with strong time constraints and pressure to perform, with the shares of women (50%) and men (52%) not differing significantly. On the other hand, frequently occurring time constraints and pressure to perform are reported significantly less often in the age group of 15 to 24-year-olds than in the other groups (cf. Table 3). The number of employees frequently exposed to this requirement is above average in the sectors "professional, scientific and technical activities" (55%), "human health and social work activities" (55%), "accommodation and food service activities" (57%), "manufacturing" (53%), "construction" (53%), and "transportation and storage" (53%).

Strong time constraints and pressure to perform

Table 3 Work intensity. Percentage of employees stating the rating category "frequently", by age group and total per item. Source: BAuA Working Time Report Germany 2016 (BAuA, 2016)

Item	Age Group					Total
	15–24	25–34	35–44	45–54	55–64	
Strong time constraints and pressure to perform	33	50	53	54	53	51
Need to work very fast	48	48	50	49	47	49
Working on several tasks simultaneously	54	66	70	69	67	67

49% of interviewees report frequently needing to work very fast, with the share of men (46%) being smaller than the share of women (52%). There are no significant differences between age groups (cf. Table 3). An above-average share of employees in the sectors "wholesale and retail trade of motor vehicles and motorcycles" (56%), "accommodation and food service activities" and "human health and social work activities" (53%) as well as "construction" (51%) is frequently faced with this work requirement.

Need to work very fast

Working on several tasks simultaneously

67% of interviewees state frequently working on several tasks simultaneously – again, the share of men (65%) is smaller than the share of women (70%). The share of employees frequently dealing with this requirement is smaller among younger people (15 to 24 years old) than in the other age groups. In the sectors “education” (77%), “other service activities” (75%), “human health and social work activities” (74%), “arts, entertainment and recreation” (74%), and “professional, scientific and technical activities” (71%), an above-average share of employees reports frequently needing to work on several tasks at the same time.

Overall, work intensity represents a working condition factor which is assessed as occurring frequently by at least half the respondents, therefore being common across all sectors. However, as shown in the analysis, it particularly affects women and older employees. In addition, this work requirement exists particularly in those sectors of the economy (services, human health and social work activities, construction, accommodation and food service activities) in which contact with customers and patients is a typical feature.

Disturbances and interruptions

A total of 47% of the interviewees report frequent disturbances and interruptions during work. The share of men is 45% here smaller than the share of women 49%. In the age groups of 25 to 34-year-olds (48%), 35 to 44-year-olds (49%) and 45 to 54-year-olds (47%), the relative number of those affected by this working condition factor is significantly higher than in the age group of 15 to 24-year-olds (36%). In the sectors “professional, scientific and technical activities” (51%) as well as “human health and social work activities” (51%), an above-average share of respondents reports frequently occurring disturbances and interruptions.

While almost one out of two employees is faced with this work requirement, such working conditions again occur more frequently among women and older employees.

Overall, the share of employees affected by the individual working condition factors analysed varies greatly, ranging from 22% (need to frequently hide feelings) to 73% (being in a position to plan and structure one’s own work frequently). Further analysis shows, however, that even those work requirements generally occurring less frequently can be significantly more predominant in individual sectors of the economy (e.g. the need to hide one’s feelings or an exact specification of the workflow). In addition, the findings show that various aspects of latitude for initiative tend to occur more frequently for men than for women, with the latter dealing more frequently with aspects of emotional labour, work intensity as well as disturbances and interruptions. Furthermore, the share of those affected by the analysed work requirements is the smallest for young employees, i.e. 15 to 24-year-olds, in most cases of working condition factors. Overall, the available assessments by the employees justify the conclusion that the working condition factors considered in the subject area “Working task” are indeed still relevant.

2.2.3 Findings

2.2.3.1 Scientific evidence on working condition factors

As a general remark, it has been found that the working condition factors are associated with various indicators of well-being, such as job satisfaction, experience of stress or emotional well-being. In addition, associations with mental disorders can be identified for individual

components of the factors latitude for activity at work, complete activities, emotional labour, disturbances and interruptions as well as work intensity.

For instance, latitude for activity at work, as well as latitude for initiative and decision-making, yield moderately positive effects on motivation and job satisfaction, as well as small to medium effects on depression, depressive symptoms, depressive disorders, burn-out symptoms, emotional exhaustion and depersonalisation. For health-related outcomes, linear as well as curvilinear cause-effect relationships are discussed, as some studies showed negative health effects even in cases of a high degree of latitude for activity at work. However, a systematic, comparative review of the two cause-effect models has not been performed yet. In addition, it cannot be excluded that the discovered non-linear effects are also caused by other factors occurring in parallel with a high degree of latitude for activity at work, e.g. unclear definition of roles or increased work intensity. Under these conditions, it is possible that latitude for activity at work was given in conjunction with greater responsibility which did not match the performance capabilities of the employees, or may have referred to activities which were not considered legitimate tasks. However, the majority of publications provided evidence for the beneficial effect of latitude for activity at work on health, therefore representing a resource (cf. in extenso Bradtke et al., 2016b; Bradtke & Melzer, 2016b; Rosen, 2016b).

Latitude for activity at work,
latitude for initiative and
decision-making

Studies on emotional labour frequently register burn-out as an outcome metric of interest. These studies show empirically that surface acting and emotional dissonance, in particular, as components of emotional labour, are accompanied by increased emotional exhaustion and depersonalisation of employees. In addition, surface acting and emotional dissonance are also detrimental to job satisfaction. The degree of these associations varies between low and medium and supports the classification of this factor as a stress factor due to the direction of the association (cf. in extenso Schöllgen & Schulz, 2016c).

Emotional labour

In the same way as with emotional labour, disturbances and interruptions of work are linked to burn-out, emotional exhaustion, distancing and depressive tendencies. Job satisfactions also diminishes if disturbances and interruptions occur frequently. In summary, it can therefore be said that this working condition factor represents a stress factor associated with small to medium effects on health. However, depending on the type of activity interrupted and on the type of interruption, the cause-effect relationships can take various forms and therefore depend on context. For instance, not exclusively associations with negative indicators of mental health were observed, but also less pronounced exhaustion in case of repetitive activities. In addition, disturbances are inherent to the profession in some fields – e.g. in emergency medicine – and are accordingly considered rather legitimate, with less intense consequences of stress resulting (cf. in extenso Rigotti, 2016b).

Disturbances and
interruptions

A multitude of findings on mental health is available, particularly on burn-out syndrome, for the quantitative requirements as a component of work intensity referring to workload, time available and pace of work. In accordance with the theoretical assumptions of the job demand control model, employees facing high quantitative demands increasingly showed emotional exhaustion and depersonalisation, while also being strongly affected by depression and anxiety. Here also, the findings are of low to moderate intensity, likewise labelling this factor a stress factor (cf. in extenso Stab, Jahn & Schulz-Dadaczynski, 2016b; cf. also Stab & Schulz-Dadaczynski, 2017).

Work intensity

The analyses of the studies did not examine the interaction of the working condition factors with other factors in depth. To date, only a few studies on emotional labour have treated the potentially attenuating effects of “social sharing” (in terms of an exchange between employees on difficult customers, patients and clients), feedback as well as the adequate design of rest breaks in order to facilitate detachment. Indeed, several studies hint at the fact that e.g. greater latitude for activity at work and social support can attenuate the negative effects of work intensity, emotional labour, disturbances and interruptions.

Overall, there are substantial differences between the working condition factors regarding the number of available studies. For instance, a large number of studies is available for both the quantitative requirements as components of work intensity and for the latitude for activity at work. A reason for this, among other things, is that both factors are well established scientifically, as they are found in the job demand control model and in the job demand-resources (JDR) model, respectively, and are therefore frequently studied. The fact that barely any findings are available on other predictor-criteria associations should not lead to the conclusion that no effects are to be found here: they are merely less often the subject of research.

2.2.3.2 Design

Overall, it can be observed that statements on the design of working condition factors are based on analyses of associations in the majority of studies and can therefore be considered design recommendations, while there is only a very small number of interventional studies providing substantiated design knowledge. Among the suggestions are both preventive behavioural measures focussing on working conditions and behaviour-oriented measures focussed on the employees.

Positive impact on health of latitude for activity at work and latitude for initiative and decision-making

Tried and tested preventive behavioural measures are the creation of latitude for activity at work, i.e. latitude for initiative and decision-making, and complete activities due to the predominantly positive impact on health, well-being and performance. In addition, empirical findings show that the negative effect of a factor can be reduced by offering social support and creating latitude for activity at work. In terms of working condition related prevention, the working conditions should be designed in such a way that allows for optimal development of social support and latitude for activity at work. In terms of behavioural prevention, employees should additionally be enabled to utilise these factors for their own benefit. Training managerial staff to support their employees can contribute to an improvement of the impact of these design measures.

Design of the working condition factors themselves

In addition, designing the working condition factors themselves is also possible: As far as work intensity is concerned, adequate staffing, organisation of rest breaks, clarification of roles and training options are examples of potential design approaches for employees. With regard to latitude for activity at work, e.g. the principle of workplace rotation has been proposed as beneficial to health and well-being, provided that this does not entail an increase in work intensity.

Similarly, job enrichment is a potential design principle for the factor of completeness, which is positively associated with health, job satisfaction/motivation and performance, provided that employees are accordingly qualified. Well-designed tasks do not only include preparatory, executive and supervisory activities, but are in addition perceived as meaningful.

The examples cited above demonstrate that design can both reduce work requirements with a negative impact and foster adequate handling of them by introducing appropriate resources. For individual factors, critical manifestation attributes can be formulated which should be avoided, e.g. in case the tasks cannot be performed within a given period while satisfying quality requirements, or disturbances and interruptions are possible over the entire workday. If critical manifestations of a factor exist, a need for action arises.

The findings also show that the effects of working condition factors are non-specific, i.e. affecting various indicators of mental health. It is important to note, however, that the effectiveness of a design approach addressing a specific factor always depends on the manifestation of other factors, i.e. the overall load constellation. For this reason, there is no guarantee that a specific measure will yield the expected success. Also relevant here are work-related orientation (e.g. excess motivation) and employee strategies for coping with work requirements. It should also be considered that design measures can also have an impact on other organisational units or customers.

Accordingly, it seems appropriate that the design process should not only involve expert knowledge regarding design principles and rules, but also the specific operational knowledge of employees regarding the working condition on site. It is only possible to a limited extent to formulate rather general design solutions applicable to all sectors and businesses. Specific design measures to be applied to a company appear more promising, the impact of which should be reviewed before further measures are implemented. In addition, it should be considered that design objectives may partly contradict each other, as the working condition factors do not apply independently, but interact. Such conflicts of objective must be made transparent.

Specific workplace design measures

2.2.3.3 Need for research

The individual working condition factors of the subject area “Working task” do not apply independently, but interact with other working condition factors. To date, however, only few studies have focussed on these interactions, meaning there is still a significant need for research.

In addition, the scoping reviews have highlighted that the empirical studies of cause-effect relationships between working condition factors and mental health have only rarely addressed the issue of temporal stability and temporal cumulation of the examined working condition factors. Frequently, the working condition factors were measured once, at the start of the study, and the associations regarding the criteria metrics were determined assuming an invariable impact of the factors over time. As there will probably be an even greater dynamic of working conditions in the future, studies permitting the consideration of such changes over time or of cumulative effects are necessary.

Temporal stability and cumulation of working condition factors

As the majority of studies is based on cross-sectional studies, the initiation of longitudinal studies and interventional studies should be intensified in order to be able to derive statements on the causality of the cause-effect relationships of working condition factors. The existing variety of methods, i.e. both condition-related and personal procedures, should be utilised in the process.

Longitudinal and interventional studies

The studies conducted to date have primarily focussed on the analysis of linear associations, while examinations of curvilinear interdependencies have been limited to small number of

cases. It should be clarified if such curvilinear effects can possibly be traced to tertiary variables interfering with the linear effect of a working condition factor.

For traumatic stress in particular, measures to increase perceived security in the daily routine of employees should be initiated, as should studies to review the effectiveness of training to prepare for such events.

EXPERT DISCUSSION ON SUBJECT AREA “WORKING TASK”

The following notes and considerations resulted from the discussion:

- The “working task” continues to play a central role in the context of mental load, as its design always requires the coordination of the organisational, social and technical components with the objective of a successful completion of the tasks.
- The classification of factors as “stress factors” and “resources” depending on their typical effect is particularly useful in the context of design, with work intensity, disturbances and interruptions as well as emotional labour to be classified as stress factors, and the latitude for activity at work to be classified as a resource.
- “Latitude for activity at work” represents a key factor in work design; however, it can only be effective if it is acknowledged and put to use by employees.
- “Emotional labour” can also be characterised as a key factor, as it is, on the one hand, a subcomponent of many activities and, on the other hand, particularly in the service sector, a predominant activity feature.
- In some professions, e. g. in emergency medical services, “disturbances and interruptions” are perceived as an integral part of the activity. Independent of their legitimacy, disturbances and interruptions generally need to be designed (e. g. by means of a “quiet hour”).
- Work design should not always strive to minimise the manifestation of stress factors, but to optimise the constellation of working condition factors which not only reduces work requirements with an impairing effect, but also fosters the development of resources.
- The impact of the considered working condition factors is rather unspecific: The health-related outcome variables can be influenced by means of the design of different factors. It should be taken into account in this context that the effectiveness of a design measure focussed on one factor always depends on the manifestation of other factors.
- Not only the experts in the field, but also the employees should be involved in the design and implementation of design measures in the workplace.
- Future research should examine the interaction between the working condition factors and the effect of the progress of stress loads over time.

2.3 Subject area “Leadership and organisation”

2.3.1 Description of working condition factors

The subject area “Leadership and organisation” includes the working condition factors (1) leadership, (2) social relationships, (3) organisational justice, (4) atypical forms of employment, and (5) job insecurity. The number of abstracts examined to determine whether they fitted the subject ranged from 1,208 (social relationships) to 6,985 (leadership), of which between 123 (social relationships) and 616 (organisational justice) publications formed the basis for the reviews.

The subject area “Leadership and organisation” on the one hand focusses on central concepts such as leadership, organisational justice and social support, but also on factors which have gained importance due to changes in the working world, e. g. atypical forms of employment and job insecurity. Social relationships and leadership as features of the social environment are also included in surveys of the labour force and the general population, such as the Stress Report Germany 2012 or the GEDA Study (Robert Koch Institute, 2014) as important factors (e. g. with an impact on well-being). Generally, a difference has to be made between emotional and instrumental support by colleagues and superiors – considered resources – and harassment or bullying as a negative form of social support, requiring separate investigation.

Social relationships
and leadership

Studies on so-called healthy leadership highlight that this can attenuate negative effects: It is more than simple task and structural orientation, focusses particularly on social aspects such as appreciation, consideration and involvement of employees, therefore – as a resource – benefiting health. The role of the managerial staff in the design of cooperation with employees, as well as the transparent communication of decisions on work organisation and the creation of opportunities for participation, are some of the elements which are important in humane work design. Feedback to employees, e. g. on their work products and their performance at work, plays an important role in this.

In the context of the debate about justice and fairness, the models of “organisational justice” and “effort-reward imbalance” have been established, according to which employees expect an adequate reward for the effort they put in – this reward may be in the form of offered training and qualification or opportunities for promotion. A negative impact on health has to be expected e. g. if this gratification is not proportional to the effort the employee has put in. In the model of organisational justice, what is most relevant is so-called interactional or interpersonal justice, i.e. the appropriate appreciation and recognition of work by superiors and colleagues. Another important aspect is procedural justice, which manifests itself e. g. by the fact that employees know how workplace decisions have been made, but also that they have the opportunity to exert their own influence in their field of work, i.e. that they are involved in decision-making processes. This also requires informational justice, which exists if employees are adequately informed about business processes, their status and changes to them. An additional relevant factor is distributive justice, which refers to the provision of resources.

Justice

Global competition often prompts businesses to adapt their organisation, among other things, which may involve changes to working tasks and team structures or even changing their location and reducing the workforce. As a consequence, almost one third of all

Job insecurity

employees are affected by fundamental company restructuring or reorganisation (BAuA Stress Report: Lohmann-Haislah, 2012). This can result in job insecurity: For instance, 12% of the employees interviewed for the Stress Report 2012 reported having doubts about the security of their job (BAuA Stress Report: Lohmann-Haislah, 2012).

Atypical forms of employment

Atypical forms of employment (fixed-term employment, people working more than one job, self-employment with or without employees, and contract employment) are another factor discussed in association with mental health, with a total of 25.4% of employees reporting an atypical form of employment (for the individual prevalences see Table 4/BAuA, 2016). The consequences of such forms of employment depend on whether they are e. g. a temporary part of the qualification phase or whether older employees are continuously facing such employment situations.

2.3.2 Current importance of working condition factors

A continuous growth of the share of atypical forms of employment has been observed over the past decades. However, the current prevalence rates for the different types of employment vary. While contract workers, at 2.9%, are the rarest type found on the job market, fixed-term employment, at 11.8%, is the most common type of employment (see Table 4). The rise in the share of atypical forms of employment can be explained primarily by a rise in self-employment (with and without employees), fixed-term employment and people working more than one job. For instance, the number of self-employed people has risen by 24% between 1991 and 2014, with the largest share represented by single-person businesses (Statistisches Bundesamt [Federal Statistical Office], 2015a). During the same period, the number of people working more than one job has risen by 13%, with a total of 2 million people in 2014 (Statistisches Bundesamt [Federal Statistical Office], 2015b). The sharpest increase of 42%, however, has been observed for temporary employment (Statistisches Bundesamt [Federal Statistical Office], 2015c).

Job insecurity

A prevalence rate of 9.5% was determined for job insecurity, with the fear of losing one's job closely associated with organisational restructuring (Keim et al., 2014).

Social relationships

Aspects of social relationships have been recorded in the context of the survey by means of two items, namely "How often do you get help and support from colleagues at work if you need it?" and "How often do you get help and support from your line manager?". Almost 26% of employees state that they rarely to never get any support from their line manager. About 14% report that their superior occasionally to often treats them inconsiderately.

Table 4 Prevalence rates for aspects which can be associated with the working condition factors (WCFs) from the subject area “Leadership and organisation”. Source: BAuA Working Time Survey 2015 (BAuA, 2016)

WCF in the project “Mental health in the working world”	Items of the BAuA Working Time Survey which can be assigned to the WCFs	Prevalence rate in %
Atypical forms of employment	Temporary employment: ■ Is your current employment relationship temporary or permanent? (yes/no; assessed: “yes”)	11.8
	Multiple jobs: additional question regarding employment status ■ Do you hold more than one job? (yes/no; assessed: “yes”)	6.9
	Self-employment in a single-person business: ■ In what position are you currently employed? (Self-employed) in combination with ■ How many persons in total are employed in your company? (if response = 1 – single-person business)	3.8
	Temporary employment: ■ Are you employed with a temporary employment agency which transfers you to other companies? (yes/no; assessed: “yes”)	2.9
Job insecurity	■ Are you worried that you might become unemployed in the foreseeable future? (yes/no; assessed: “yes”)	9.5
Social relationships	■ How often do you get help and support from your colleagues at work when you need it?	91.1
	■ How often do you get help and support from your immediate superior? (assessed response options: “frequently” and “sometimes”/ employees only)	73.9
Justice (employees only)	■ Work is fairly distributed in the company I work for.	51.2
	■ The work I do is adequately appreciated.	58.7
	■ My job offers adequate career options. (assessed response options: “particularly true” and “mostly true”/ employees only)	35.0
Destructive leadership (employees only)	■ How often are you treated inconsiderately by your immediate superior? (assessed response options: “frequently” and “sometimes”/ employees only)	13.6

18.6% of those interviewed think that their company distributes work rather unfairly, while 16.6% miss being adequately rewarded for their work. 38.7% of interviewees think that the statement “My job offers adequate career opportunities” only applies to them to a limited or very limited extent.

Although there is significant variation between the shares of employees affected by the different working condition factors, the determined prevalences match the results reported in other studies (e. g. the BAuA Stress Report 2012: Lohmann-Haislah, 2012), which justifies the overall conclusion that the working condition factors considered in the subject area “Leadership and organisation” have maintained their importance and therefore continue to be relevant.

2.3.3 Findings

2.3.3.1 Scientific evidence on working condition factors

In the subject area “Leadership and organisation”, the scoping reviews prepared in the context of the project on the following five topics are described in summary: (1) leadership, (2) social relationships, (3) organisational justice and “effort-reward imbalance”/ERI, (4) atypical forms of employment, and (5) job insecurity.

Leadership The scoping review on leadership shows positive associations of minor-to-average significance of a task and relations-oriented leadership style with mental health. On the other hand, a destructive leadership style is related to significant impairment of mental health. These findings highlight the dual role of the factor of leadership: while relations and task-oriented leadership acts as a resource, destructive leadership is a stress factor. In addition, this shows that leadership assumes a particularly central role due to its interaction with other working condition factors. This aspect is discussed in more detail below in the section “Design” (cf. in extenso Montano, Reeske-Behrens & Franke, 2016b).

Effort-reward imbalance Much research has been done in the subject area of effort-reward imbalance, although this is not a working condition factor in the proper sense: ERI is rather an element of stress and takes the function of a link between factors of work and outcomes of mental health. Its focus is on the potential disruption of the balance between the effort of an employee and the resulting outcome (e. g. job security, career, appreciation, remuneration). For disruptions of this balance (ERI), consistent positive associations of average significance with impairment of physical and mental health (burn-out, cardiovascular diseases, musculoskeletal diseases) have been found, the effects of which can also be shown in longitudinal studies.

Organisational justice Organisational justice consists of the fairness of resource distribution in the organisation as perceived by the employees and the processes underlying this distribution. Particularly leadership structures and the actions of managerial staff play an essential role in interactional and procedural justice. Consistent associations of minor-to-average significance can be found between organisational justice and mental health; experiencing injustice is consistently linked to impairment of mental health. What the constructs of ERI and organisational justice have in common is that both feature subjective processing of the work situation by employees. For occupational safety, the ERI concept is problematic and of limited use, as any effort – even if potentially excessive over the short or long term – can be compensated for by a reward con-

sidered appropriate, and any deliberations on the limitation of such expenditures is lacking (cf. in extenso Haupt, Backé & Latza, 2016d).

The scoping review on atypical forms of employment shows that different forms of temporal limitation, part-time employment and forms of self-employment need to be considered separately. To begin with, there are associations of minor-to-average significance between temporary or contract employment and depression. This shows that not only the type of employment is causal for differences in mental health, but also the working conditions distinguishing between “atypical” and “regular” employees. To this extent, the factor “atypical forms of employment” is confounded by differences in other working conditions. For instance, atypical employees are often granted less latitude for initiative, participation and scope of activity. Small effect sizes for depression and performance are found for fixed-term employment. Contrary to what one would expect, the determined associations initially seem to indicate that fixed-term employment is associated with better health, greater satisfaction and better mental well-being. Closer analysis shows, however, that this is only true for employees who – in the context of a sufficiently long contract – obtain certain qualifications during their fixed term of employment and who are in a phase of life which is compatible with these conditions. As another atypical form of employment, the association of self-employment in a single-person business with mental health was examined. The results reflect the ambivalence of self-employment. For instance, people self-employed in a single-person business more frequently report mental and physical impairment, but also better general health, higher satisfaction, motivation and performance in comparison with employees (cf. in extenso Hünefeld, 2016c). Self-employment is therefore an ambivalent form of atypical employment, which may entail impairment of health, but also represents a resource positively associated with job satisfaction (Andersson, 2008; Benz & Frey, 2008).

Atypical forms of employment

Social support largely shows the expected effect as a resource in the underlying scoping review: small effects substantiated also in longitudinal studies can be found for positive outcomes regarding mental health, e. g. for well-being. Consistent effects also result from the negative manifestation of social relationships in the workplace – harassment in its most extreme forms – and health impairment (increased risk of depression, distress and other health issues) as well as well-being (cf. in extenso Drössler et al., 2016b).

Social support

Job insecurity – a stress factor of increasing importance in a changing world of work – shows limited, but consistent associations with health in such a way as high insecurity is associated with impairment of health. The associations with mental health are stronger than those with physical health. Job insecurity is associated with organisational restructuring; therefore the indicated impact on mental health of employees is of particular importance in the context of workplace design (cf. in extenso Köper & Gerstenberg, 2016a).

Job insecurity

The overall assessment of the subject area “Leadership and organisation” predominantly shows associations for the individual working condition factors which would have been expected on the basis of theoretical predictions. For instance, major manifestations of a factor acting as a resource (e. g. social support, relations-oriented leadership) are primarily associated with positive manifestations of mental health. Major negative manifestations of a factor (e. g. harassment, destructive leadership, a lack of fairness, job insecurity), on the other hand, are consistently associated with negative manifestations of mental health. Atypical forms of employment are an exception here: the heterogeneity of the forms of employment considered

and the consequential variety of working conditions experienced by employees do not allow general statements to be made. In all atypical forms of employment, aspects such as working conditions, the phase of life, individual need for security, etc. have an impact on whether the form of employment negatively impacts mental health and how strongly.

2.3.3.2 Design

In the majority of studies considered the derivation of design statements is merely of marginal, in many cases even of no importance at all. Verified design knowledge based on interventional studies is only available to a small extent for the working condition factors considered in this subject area. The large majority of design statements in the underlying literature were characterised by derivations based on plausible conclusions made by the authors.

Relations and task-oriented leadership

Nonetheless, at least some substantial recommendations can be derived on the basis of statistical associations extracted from the included studies in the context of the reviews. For instance, leadership should be relation-oriented and at the same time task-oriented. A high quality of social interaction between employees and managerial staff is particularly important for well-being and mental health. This requires an organisational framework which provides the required resources (occupational policy approaches, knowledge, time, authorisations, financial resources, etc.) to the managerial staff and employees alike. Negative social behaviour, such as destructive leadership and harassment, should be avoided at all cost. Justice is promoted by specific leadership behaviour (i.e. good, transparent and individualised communication, involvement of employees, fair processes, appropriate social behaviour, etc.). Justice principles should be considered and implemented in the organisation – with procedural justice appearing to be of particular importance here. The negative consequences of job insecurity impacting mental health can, for instance, be attenuated by well-structured and transparent communication, fair processes, participation and improvement of employability.

Overall, it is apparent that the consideration/implementation of these central principles in the organisation is primarily done by means of leadership on the level of the operational management. This also applies to phases of organisational change. Leadership therefore has a key function in the design of working conditions, preventing a negative impact on the mental health of employees and potentially strengthening resources of mental health.

2.3.3.3 Need for research

Working and framework conditions for managerial staff

The scoping review on the issue of leadership is primarily concerned with the – well-researched – leadership styles of managerial staff. The current state of research on leadership behaviour presents a marked contrast to this as well as to the key role leadership plays on all organisational levels for the design of working conditions: there are only few studies examining specific leadership behaviour in association with mental health. Due to the various cross-links with all other factors of the subject area, more findings on the working and general conditions of managerial staff – particularly in business environments with a high degree of change – should be obtained, e.g. on the basis of qualitative studies analysing not only the interaction patterns between managerial staff and employees, but also the underlying (more or less supportive) organisational structures and concepts.

In the context of the project “Mental health in the working world”, the working condition factors and their impact on mental health have been considered independently, as the primary studies included are focused rather on individual issues than on the impact of several stress factors combined or load constellations. It is nonetheless important to develop a better understanding of process chains (mediation, moderation) with regard to the impairment of mental health or mental well-being. At the same time, it would be beneficial to find out more about the impact of several stress factors combined. In principle, it is imaginable that several working condition factors have an additive, progressive, compensatory or other impact on mental health. The known stress models (Demerouti et al., 2001; Karasek & Theorell, 1990; Siegrist, 1996a, 1996b) suggest that certain combinations of working condition factors entail specific effects. Some unresolved issues remain regarding the working condition factors considered in the project or in the individual subject areas. For instance, job insecurity appears to mediate the impact of atypical forms of employment on health. For the consideration of several stress factors combined, it could also be interesting to analyse sector-specific issues, and therefore typical load constellations in various sectors of the economy, in more detail.

Combinations of
working condition factors

As is the case for the interaction of several working condition factors and their interaction with individual factors, little research has been conducted so far on the long-term effects of working conditions considered in the subject area “Leadership and organisation”. The vast majority of studies considered for all working condition factors of the subject area were cross-sectional studies. More longitudinal studies in the field would be necessary for the consideration of duration of impact, long-term effects, causal relationships and an estimation of the effectiveness and usefulness of specific interventions.

Long-term effects of
working conditions

EXPERT DISCUSSION ON SUBJECT AREA “LEADERSHIP AND ORGANISATION”

The following notes and considerations resulted from the discussion:

- “Leadership” is associated with a multitude of other working condition factors and therefore represents a key factor.
- Leadership activities happen at all levels of an organisation – from the board of directors to the line manager – and is not limited to the dyadic relationship between superior and employee, but is embedded in an organisational framework of structural workplace factors.
- The examined working condition factors are mostly characterised very strongly by their subjective perception by the employees, complicating their design.
- Although the effect sizes are only numerically small in many cases, the respective working condition factors are not insignificant if they affect a large number of employees.
- Work design cannot be solely the responsibility of the managerial staff. Suitable structures must be created at the organisational level, as e. g. corporate standards, rules and instructions contribute to relieving the burden of responsibility carried by managerial staff and can make the definition of their roles easier.
- Unacceptable behaviour, such as harassment or destructive leadership, should be avoided and penalised.
- Adequate concepts of leadership should be developed for new forms of work, such as human-robot cooperation or “click working”. Accordingly, it should be assumed that the subject area “Leadership and organisation” will increase in importance in the future due to the change in the working world.

2.4 Subject area “Working time”

2.4.1 Description of working condition factors

The subject area “Working time” consists of the working condition factors (1) atypical working time, (2) work-related permanent availability, (3) rest breaks, (4) detachment, (5) mobility, and (6) work-life balance. Here the number of the abstracts reviewed for relevance of contents varies between 1,923 (detachment) and 8,350 (rest breaks), of which between 103 (work-life balance) and 185 (atypical working time) studies could be included.

As e.g. the physiological performance capacity of humans fluctuates over the course of the day, the people-oriented effects associated with the performance of a working task is dependent on working time, among other things. Generally, working time can be described by duration (e.g. as daily, weekly, yearly or life working time), time of day (e.g. shift work, weekend work, nighttime work), distribution (e.g. rest breaks, rest periods, accumulation of working time and rest periods), dynamics (e.g. as a chronological sequence of working time and rest periods), stability and planning options (e.g. predictability of scheduling, binding character of defined working time and rest periods), and the permitted flexibility in their definition (Nachreiner, 2011).

The dichotomous treatment of working time and rest periods as two strictly separate areas does not (or no longer) represent reality, however. Rather, the clear line between working time and rest periods appears more and more blurred in today’s working world as a consequence of digitalisation and flexibilisation.

It is therefore important to simultaneously consider the issue of “rest periods” in the subject area “Working time”. This should include an examination of the purpose of rest periods. Ultimately, rest periods do not equal recovery periods, as employees often have other obligations besides work and the amount of time spent on work-related activities is continuously increasing due to rising mobility requirements. Generally, the questions needs to be asked which aspects determine rest periods and recovery periods, and how the dynamics of work(ing time) and recovery impact mental health.

Working time and rest periods

In the context of the BAuA project “Mental health in the working world”, the subject area “Working time” has therefore been designed to include six reviews of the following topics located in the continuum between working time and rest periods (Figure 4):

- Atypical working time (long working hours, shift work, weekend working hours, flexible working hours)
- Rest breaks
- (Geographic) mobility
- Work-related permanent availability
- Detachment
- Work-life balance



Fig. 4 Classification of factors in subject area “Working time”

**Long working hours
shift work, weekend working
hours and on-call work**

The traditional topics of working time are found nearer to the pole of working time in the continuum between working time and rest periods. This includes the key aspects of duration, time of day and distribution of working time. In the context of the project, these aspects have been examined applying a focus on more strenuous working times, i.e. long working hours, shift work, weekend working hours, and on-call work, as well as on-call duty/standby duty, already highlighting the shifting line between working time and rest periods. In addition, rest breaks at work were considered as a traditional topic of working time research. As short interruptions of work, they offer the option of short-term recovery.

**Flexible working hours,
mobility and work-related
permanent availability**

Among the topics currently gaining more and more attention in the discussion of working time are flexible working hours (options for the control of working time, predictability of working time and demand-driven working time, i.e. variable working time as determined by the employer), mobility and work-related permanent availability, which are instrumental in defining the line between working time and rest periods, but also in the blurring of this line.

**Detachment and
work-life balance**

In the context of the overall analysis of the effects and the design of working time, the topics of detachment and work-life balance are additionally considered as influencing variables within the subject area “Working time”. These topics are correlated with psychological topics of working time design, mirroring the subjective perception of the interaction between working time and rest periods. They reflect the successful drawing of lines or the integration of working time and rest periods or recovery. Both detachment from work and work-life balance are often the consequence of work design. They therefore fulfil an intermediary function between specific work design and the mental health of employees.

2.4.2 Current importance of working condition factors

In the context of working time reporting (BAuA, 2016), the duration of working time was determined by means of the actual weekly working hours. For this purpose, the participants were asked: “How many hours do you usually work on average in this capacity per week – including regular overtime hours, extra work, standby duty, etc.?” Overall, 44% of those interviewed stated long working hours between 40 and 47 hours, while 17% report overly long working hours of at least 48 hours per week, with a significantly higher share of men than women, with the latter more frequently working part-time.

Actual weekly working time

The longest average working times are found in the sectors with a very high share of full-time employees, such as “water supply; sewerage, waste management and remediation activities” (41.8 hours), “electricity, gas, steam and air conditioning supply” (41.7 hours), and “construction” (41.6 hours).

Table 5 Actual weekly working time. Percentage of employees.

Source: Working Time Report Germany 2016 (BAuA, 2016)

Actual weekly working time						
	10–19 hrs	20–34 hrs	35–39 hrs	40–47 hrs	48–59 hrs	> 60 hrs
Total	6	17	16	44	13	4
Gender						
Men	2	5	16	54	18	6
Women	11	32	16	33	7	2
Economy sectors						
Public administration	6	22	17	42	10	3
Industry	1	7	22	52	15	3
Skilled trades	4	10	13	55	15	3
Services	10	23	12	39	12	5
Other sectors	7	22	16	36	15	5

n = 17,944; all numbers are row percentages; rounding errors are possible

Shift work and offset working times

To determine the prevalence of shift work, the interviewees initially were asked to state whether their working time usually falls into the period between 7 a.m. and 7 p.m. If this was the case, they were further asked whether they did shift work, and if yes, what shift types.

Overall, 80% of employees usually work between 7 a.m. and 7 p.m., 8% work offset working times, such as fixed early or late shifts, 5% work alternating shifts without any night work, and 7% work alternating shifts with night work or permanent night shifts. The latter is true for more men than women, with older employees aged 55 years and older working night shifts less frequently than younger employees (cf. Table 6). This type of shift work is particularly frequent in the industrial sector. Therefore, a sector-specific focus is useful for the examination of time of day of working times – particularly of night work.

Table 6 Shift work and offset working times. Percentage of employees.
Source: Working Time Report Germany 2016 (BAuA, 2016)

Shift work and offset working times				
	Working time between 7 a.m. and 7 p.m.	Offset working times	Rotating shifts without night work	Rotating shifts with night work and per- manent night work
Total	80	8	5	7
Gender				
Men	78	9	4	8
Women	83	7	5	5
Economy sectors				
Public administration	83	6	3	8
Industry	74	7	6	13
Skilled trades	86	8	4	*
Services	81	9	6	4
Other sectors	81	9	*	6

*n = 17,934; all numbers are row percentages; rounding errors are possible; * number of cases too small*

The prevalence of weekend working hours was determined by means of the share of survey participants stating that they work on Saturdays and/or Sundays or public holidays at least once per month. It was found that almost half of all employees work weekends regularly, i.e. at least once per month (43%), with men being affected slightly more frequently than women. This is true particularly for weekend working hours on Saturdays only. With progressing age, employees work weekend working hours less frequently. Weekend working hours including Sundays are significantly less prevalent in public administration than in other sectors of the economy. The sector-specific assessment shows that weekend working hours including Sundays primarily affect employees in the sectors of “accommodation and food service activities” (59%) and “arts, entertainment and recreation” (42%).

Weekend working hours

Table 7 Weekend working hours. Percentage of employees. Source: Working Time Report Germany 2016 (BAuA, 2016)

Weekend working hours			
	No weekend working hours	Weekend working hours, Saturdays only	Weekend working hours including Sundays
Total	57	20	23
Gender			
Men	54	22	24
Women	60	17	23
Economy sectors			
Public administration	58	9	32
Industry	62	20	18
Skilled trades	57	31	12
Services	53	28	19
Other sectors	54	13	33

n = 16,745; all numbers are row percentages; rounding errors are possible

Table 8 below shows the share of employees who are in control of the start and end times of their work, are affected by frequent changes of working times for operational reasons, and who are working on demand or in jobs involving on-call duty and standby duty.

Flexible working hours

Almost half of those interviewed (45%) state having little control over the start and end times of their work. The largest group of employees assessing their control over the daily start and end times of work as high are working in the industrial sector.

Table 8 Flexible working hours. Percentage of employees. Source: Working Time Report Germany 2016 (BAuA, 2016)

Flexible working hours					
	Frequent changes to working times	High level of control of start and end times of work	Work on demand	On-call duty	Standby duty
Total	14	38	7	7	8
Gender					
Men	14	40	7	8	11
Women	13	36	6	5	6
Economy sectors					
Public administration	15	38	6	9	9
Industry	11	45	4	4	7
Skilled trades	12	25	8	6	7
Services	14	39	8	5	8
Other sectors	16	37	8	10	11

Changes to working times: n = 18,059; control of start and end times of work: n = 18,055; work on demand: n = 18,003; on-call duty: n = 18,058; standby duty: n = 18,034; all numbers are row percentages; rounding errors are possible

14% of employees state that their working times change frequently for operational reasons (cf. Table 8). Almost half of those affected report being notified of such changes no sooner than on the same day or the day before. Employees in the industrial sector and in skilled trades are slightly less likely to be affected by such working time changes than employees in public administration or in the service sector. Work on demand, as stated by a total of 7% of employees, is more prevalent in skilled trades and the service sector than in public administration and the industrial sector. Almost no difference between the genders could be found regarding these aspects of working time.

Standby duty (7%) and on-call duty (8%) are almost equally prevalent. Overall, 12% of employees report being affected by at least one of these two forms of flexible working time, with men again being affected more frequently than women (cf. Table 8). Younger age groups are slightly more often up for on-call duty compared with older employees. Besides "other service activities", standby duty and on-call duty occur most frequently in the public administration sector.

Rest breaks

The subject area of rest breaks considered both the cancellation of rest breaks and the individual impact of rest break timing. The survey participants were asked to state whether their rest breaks (of more than 15 minutes) are frequently cancelled during workdays (of more than six hours), and to what extent they can decide when to take their rest breaks.

Overall, more than a quarter of employees (28 %) report that their rest breaks are cancelled frequently, with women more strongly affected than men, but with cancellations generally becoming less frequent as employees get older. In the industrial sector and in skilled trades, frequent cancellation of rest breaks is less prevalent than in public administration and “other service activities” (cf. Table 9).

Table 9 Rest breaks. Percentage of employees. Source: own calculations based on data from the BAuA Working Time Survey 2015 (BAuA, 2016)

Rest breaks		
	Frequent cancellation of rest breaks	High level of control of rest break timing
Total	28	52
Gender		
Men	27	54
Women	29	48
Economy sectors		
Public administration	32	49
Industry	22	50
Skilled trades	24	49
Services	28	58
Other sectors	33	51

Cancellation of rest breaks: n = 17,532; control of rest break timing: n = 18,029; all numbers are row percentages; rounding errors are possible

Over half of all employees (52 %) can decide themselves when to take their rest breaks (cf. Table 9). Overall, this is more often the case for men, while both men and women of the middle age groups state that they can decide on the timing of rest breaks. Compared with the other sectors of the economy, independent decision-making on rest breaks is more prevalent in the service sector.

Working time reporting records the prevalence of aspect of mobility by means of two items: commuting and working from home or teleworking. The interviews included questions on the time spent on the daily commute, i.e. the total number of minutes required for the trip to work and back on a typical workday. In addition, the interviewees were asked to state whether they have entered into an agreement with their employer on working from home or teleworking.

(Geographic) mobility

Approximately half of all employees have a short commute of up to half an hour (cf. Table 10). Three out of ten employees require more than half an hour, but no more than one hour for their commute, while one in six needs more than hour to get to work and back. Whereas the commuting times of women are often shorter, men are more often affected by long commutes or those varying in duration. People employed in skilled trades face shorter commuting times compared with the other sectors of the economy.

Table 10 (Geographic) mobility. Percentage of employees. Source: own calculations based on data from the BAuA Working Time Survey 2015 (BAuA, 2016)

(Geographic) mobility				
	Short commute (1 to 30 min)	Medium commute (31 to 60 min)	Long commute (> 61 min)	Agreement on working from home/teleworking
Total	48	31	17	9
Gender				
Men	45	32	18	11
Women	52	31	15	7
Economy sectors				
Public administration	46	34	18	8
Industry	44	34	18	12
Skilled trades	55	27	12	3
Services	48	30	17	12
Other sectors	49	29	17	11

Commute: n = 18,088; agreement on working from home/teleworking: n = 18,001; all numbers are row percentages; rounding errors are possible

Less than 10% of employees have entered into an agreement with their employer on teleworking or working from home; this is more commonly the case for men and in the age group of 30 to 44-year-olds (cf. Table 10). The share of employees working from home or teleworking is significantly higher in the industrial and service sectors than in public administration and skilled trades.

Overall, the assessments show that the daily commute times of almost half of all employees are of minor significance regarding the time spent on work-related activities. For one in six employees, however, the daily commute means an increase in time spent on work-related activities of more than one hour. This concerns slightly more men than women. Agreements on working from home/teleworking are also more frequent in men than women.

The prevalence of work-related permanent availability is determined on the basis of two items: the expectations of superiors regarding the availability for business matters in private life, and the frequency of being contacted in private life for work-related reasons.

Work-related permanent availability

Overall, 22% of those interviewed stated that permanent availability was expected of them, with 12% actually being contacted frequently. The prevalences are the same for men and women. In skilled trades and public administration, work-related permanent availability is slightly more common than in the other sectors of the economy (cf. Table 11).

Table 11 Work-related permanent availability. Percentage of employees. Source: Working Time Report Germany 2016 (BAuA, 2016)

Work-related permanent availability				
	Availability is expected			Frequently contacted in private life
	False	Partly true	True	
Total	61	17	22	12
Gender				
Men	59	19	22	12
Women	63	16	21	13
Economy sectors				
Public administration	60	18	23	14
Industry	67	16	17	8
Skilled trades	59	19	22	14
Services	61	17	23	12
Other sectors	59	18	24	13

Expected availability: n = 18,069; frequency of contact in private life: n = 18,093; all numbers are row percentages; rounding errors are possible

The success of detachment from work at the end of the workday was measured by means of the question whether people often think about work-related issues during hours off. It has been shown that half of all employees are able to detach well from work, with only marginal differences between the genders or age groups. Employees in public administration are slightly less well able to detach from work than those in the industrial sector (cf. Table 12).

Detachment (from work) and work-life balance

The quality of work-life balance was determined by means of satisfaction with the fit between work and private life. Over 75% of employees are satisfied or even very satisfied with their work-life balance. This satisfaction further increases with age and is highest in public administration compared with the other sectors of the economy (cf. Table 12).

Table 12 Detachment (from work)¹ and work-life balance. Percentage of employees.

Detachment (from work) ¹ and work-life balance				
	Good detachment	Less good detachment	(Entirely) satisfied with WLB ²	Less satisfied/dissatisfied with WLB
Total	50	50	77	23
Gender				
Men	50	50	76	24
Women	49	51	78	22
Economy sectors				
Public administration	47	53	79	21
Industry	52	48	77	23
Skilled trades	49	51	76	24
Services	50	50	77	23
Other sectors	50	50	72	28

Detachment: n = 18,094; satisfaction with work-life balance: n = 18,107; all numbers are row percentages; rounding errors are possible

¹ "After work, I often think about things I have to do at work."

² WLB = Work-life balance

Overall, the obtained prevalences demonstrate the actual relevance of the working condition factors in the subject area "Working time", although some working condition factors occur more frequently in certain sectors of the economy than others. There are differences between factors regarding the share of employees affected and consequently, it may seem that some of the working condition factors are more relevant than others. Nevertheless, the prevalence of working time features should always be assessed in consideration of their qualitative importance for health. Furthermore, the context, in which they occur together in everyday workplace operations and in various constellations, should be taken into account.

2.4.3 Findings

2.4.3.1 Scientific evidence on working condition factors

Long hours

Various situations may be considered involving long working hours, from an unspecific definition of long working hours as overtime to more specific descriptions referring to a threshold of more than ten or eleven hours per day, or a weekly working time of more than 40 hours, 48 hours or more, depending on definition. The majority of secondary and primary studies included in the review compared the effects of a weekly working time of more than 40 hours with those of less than 40 hours weekly. The comparability of the study outcome was limited, however, due to the fact that the studies in part also included other comparable groups and e.g. there were different approaches to conceptualising overtime. The primary studies includ-

ed are predominantly cross-sectional studies. Overall, the outcomes show an association between long working hours and an impairment of mental health. The aggregated effects vary between small and medium in this context. In addition, a study by Backé et al. (2013) states that between 4.9% (best case) and 7.9% (worst case) of ischaemic heart diseases in the total population could be prevented if overly long working times were avoided (Backe et al., 2013).

Shift work describes extending the working hours beyond the “normal working hours”. Various manifestations are possible here, extending either to the weekend and/or into nighttime. Following a rather general classification, a distinction is made between permanent systems (i.e. shift work is performed always at the same times) and rotating systems (i.e. rotating shifts, involving e.g. one week of early shifts, late shifts and/or night shifts). Depending on whether the working times include weekends and night work, rotating systems are subdivided into continuous (i.e. including weekends and night work) and discontinuous (i.e. excluding weekends, including or excluding night work) shift systems. In most studies, predominantly designed as cross-sectional studies, the analysed shift systems are partly barely described at all or at least imprecisely described. Many studies are entirely lacking control groups (cf. Adan et al., 2012), or different studies use different reference or control groups. This necessarily results in an imprecise isolation of effects of specific shift systems (cf. Frost et al., 2009). The available outcomes confirm the earlier findings: shift work is associated with an impairment of mental health. The overall effect sizes in the studies on mental health in a narrower sense fall into the range between small and medium. Here also, the study by Backé et al. (2013) showed that 3.5% (best case) to 4.8% (worst case) of ischaemic heart diseases could be prevented if shift work was avoided (Backé et al., 2013).

Shift work

Saturday is a working day in terms of the Working Hours Act. Nonetheless, the literature commonly describes the period of Monday to Friday between 7 a.m. and 6 p.m. as “normal working time”, while referring to work on Saturdays and Sundays as weekend working hours (Janßen & Nachreiner, 2004a). To date, only few studies have examined the genuine effect of weekend working hours on health, and no overviews of the relationship between weekend working hours and mental health could be identified. The primary studies included are predominantly cross-sectional studies. Weekend working hours are associated with impaired mental health. The effects cited in the studies were mostly small to medium.

Weekend working hours

The rhythm or dynamics of working time subsumed under the term “flexible working hours” represents a central aspect of the analysis of working time design in addition to time of day and duration of working time. The contents and processes described by “flexibilisation” can vary significantly (Janßen & Nachreiner, 2004b). Flexibilisation with regard to working time can refer to influence options (or scheduling independence) on the one hand, or employee flexibility on the other hand. This means that working times are designed individually and by means of the participation of works councils. On the other hand, flexibilisation (as a flexibility requirement) can describe a situation in which companies are deploying employees variably, in terms of capacity-oriented variable working time (KAPOVAZ), with the deployment depending on operational requirements. Therefore, the following components of flexible working time have been considered: the option of influencing working time, predictability of working time, working time variability and – closely linked to working time variability – standby duty and on-call duty. On-call duty and standby duty represent particular forms of atypical working time. On-call duty is only counted as working time if the employee is called up. Otherwise it is assessed as a rest period. In contrast, standby duty is a component of working time. In

Flexible working hours

English-language literature, these two forms of working time design are often confounded and subsumed under the term of “on-call” duty (cf. Vahle-Hinz & Bamberg, 2009). In practice, the components of flexible working hours often overlap, and it cannot be entirely excluded for the data extracted here that different components have been confounded. The found differential associations (the primary study are predominantly cross-sectional studies) of the three components with mental health suggest more precise differentiation, however. The various forms of flexible working hours highlight differences in the quality of the associations with aspects of mental health. On-call work is associated with worse mental health. The effects cited in the studies were mostly medium to large. Demand-oriented (employer-determined) working time variability is similarly associated with worse mental health. The effects cited in the studies were mostly small to medium. Options of influencing working time, as well as predictability of working time, were associated with better mental health. The (partly aggregated) effects were mostly small to medium (cf. in extenso Amlinger-Chatterjee & Wöhrmann, 2017; cf. in extenso Amlinger-Chatterjee, 2016b on all aspects of atypical working times).

Rest breaks

Rest breaks are interruptions of work during working time for the purpose of recovery. They can be distinguished by numerous criteria, e. g. by length, time of day and distribution (rest break regime), their degree of formalisation (self-organised or organised by others), and their specific content as well as the location at which the break is spent. From a theoretical standpoint, it must be assumed that rest breaks do not only have a direct impact on the stress situation of employees. Their effect and individual design also depends on the configuration of working condition factors (e. g. work intensity) and personal characteristics (e. g. ability to recover, intention to recover). The state of scientific knowledge on rest breaks is marked by the predominant use of quasi-experimental interventional designs. Accordingly, the interpretation of effects frequently complicated by a lack of control of the complex association between numerous correcting variables of rest break organisation. This research makes use of a wide range of objectively and subjectively assessable indicators for the presentation of cause variables and effects of rest breaks. The review shows that short breaks have aggregated positive associations of minor-to-average significance with aspects of mental health. No aggregation of the associations was performed for further characteristics of rest breaks. However, associations of rest breaks with well-being, performance and particularly also physical symptoms are found predominantly (cf. in extenso Wendsche & Lohmann-Haislah, 2016c).

Job-associated and on-the-job mobility

Job-associated mobility takes place before and after work and serves the purpose to coordinate professional and non-professional demands (e. g. long-distance commute, weekly commute). On-the-job mobility is the result of mobility requirements of work itself, e. g. for on-site work or business trips. The review included 54 primary studies from the period between 1990 and 2015, dealing with six different forms of mobility: relocation mobility, daily commuters, weekly commuters, business trips, on-site work and secondment. A few reviews are available, while cross-sectional and interview studies predominate. With regard to study design, case numbers and assessment methods, the study quality of job-associated forms of mobility is assessed as slightly better compared with forms of on-the-job mobility. Only few studies have examined the complex interaction between family situation, working conditions and consequences of mobility for health. The studies show, however, that mobility is often negatively associated with aspects of mental health. The current heterogeneous state of scientific knowledge does not permit an adequate assessment of sizes for effects on aspects of mental health (cf. in extenso Ducki & Nguyen, 2016).

Work-related permanent availability has been defined as the possible availability of workers for work issues or of work issues for workers due to new information and communication media outside of regular working time and independent of the regular place of work. 42 articles with 141 associations overall have been researched. All of them, without exception, were interview studies predominantly reporting findings based on cross-sectional studies. The studies examine different components of availability and various indicators associated with health and private life. In summary, it can be found that work-related permanent availability is rather negatively associated with aspects of health and private life. The effect sizes vary significantly between studies. There are mostly positive associations of minor-to average significance with work-related aspects (e.g. job satisfaction; cf. in extenso Pangert, Pauls & Schüpbach, 2016).

Work-related permanent availability

What is called detachment from work describes distancing oneself mentally from work issues during rest periods. The concept therefore represents an important descriptive dimension for successful recovery processes of employees after work. Detachment from work can be understood as a link between working condition factors and employee health and well-being. The concept has been described in scientific literature only since approx. two decades ago, primarily in the context of the analysis of work-recovery cycles in knowledge-based, service and interactional work. The research interest has been growing exponentially primarily in America and in German-speaking countries. The studies conducted on this topic were primarily cross-sectional studies. Particularly diary studies are found here due to the process character of recovery. The research can be understood as questionnaire-based research for the most part. The found aggregated positive associations of detachment with health and well-being are predominantly of average significance. Additionally, mostly minor associations with performance indicators were found. Studies on the effect of detachment from work on objective health and performance indicators are currently only occasionally available (cf. in extenso Wendsche & Lohmann-Haislah, 2016d, 2017b).

Detachment (from work)

The work-life balance is in most cases examined as a conflict between roles and their demands in various spheres of life. On the one hand, the studies focus on the question how roles of different spheres of life can enrich each other. In addition, the association between satisfaction with the work-life balance is also of interest. As with detachment, the work-life balance is also considered as a link or effect mechanism between working conditions and health as well as the well-being of employees. There is a particularly high number of findings available on conflicts between work and private life, resulting in a multitude of meta-analyses, the results of which could be aggregated for the review. The underlying primary studies are predominantly designed as cross-sectional interview studies, with a discernible current trend towards study designs featuring a better methodology, such as longitudinal studies, diary studies or interventional studies. An overall result of the analyses is that a good work-life balance is associated with better mental health. The aggregated effects are predominantly small to medium (cf. in extenso Wöhrmann, 2016b).

Work-life balance

2.4.3.2 Design

The analyses of the cause-effect relationships have shown that a good design of working time, characterised by a limited amount of demands and high amount of resources, is associated with better mental health. Associations are not only found for the individual aspects of the specific design of working time (e.g. shift work, control of working time design), but also for

Design of the point of intersection between work and private life

the design of the point of intersection between work and private life (e.g. availability) as well as the compatibility of working time with other spheres of life (work-life balance).

Regarding the practical implementation of the insights, the question remains which implications result from the findings for the design of the working condition factors. In addition, the derivation of design requirements also needs to consider insights which do not exclusively focus on mental health, but also take into account other aspects of health and safety in the workplace, such as accidents or performance aspects, which are each seen as an indicator of inappropriate stress load.

Specific design statements can be made for some aspects of working time: For instance, criteria approximating limit values can be defined for factors such as shift and night work. In contrast, mere recommendations are possible for aspects such as mobility. Differentiated statements on design knowledge are primarily found for the factors of long working hours, shift/night work, rest breaks and on-call duty. The design statements on these working condition factors are generally congruent with the to-date insights and the existing regulations (EU Working Time Directive) as well as laws and recommendations on working time design at the national level (Working Hours Act).

Load limits

Quantifications are made for long working hours and shift work which permit the definition of load limits. For instance, the weekly working time should not exceed 40 hours, as a significant negative impact on mental health manifests itself here – and even more strongly for working times of 50 hours and more. No studies were available showing different outcomes depending on specific activities. Weekly working times should therefore not exceed this range. The consideration of insights from accident research show, in addition, that the accident risk increases with working times exceeding 8 hours, initially only moderately, but later exponentially. The cumulation of stressful working time aspects, such as long working hours with additional extended work-related availability, should be avoided. On the other hand, compensatory effects, e.g. resulting from an efficient design of rest breaks, are beneficial. It has also been shown that individual living conditions, e.g. job-associated mobility (commuting), can increase the general stress load in terms of an increase in time spent on work-related activities.

Limitation of the number of consecutive night shifts

The negative impact of shift work including night work, known from earlier studies, have been confirmed by the available studies; this also applies to the available findings of occupational science on shift plan design. Shift work should be designed in a way that impacts circadian rhythms and social life as little as possible. In this context, it should be ensured that the number of consecutive night shifts is limited: outcomes known from accident research show an accident risk increasing in parallel to the number of consecutive night shifts. Such results must also be considered for shift planning design (Folkard & Tucker, 2003). For instance, the accident risk in case of directly consecutive night shifts rises by approx. 6% in the second night, by 17% in the third night and by 36% in the fourth night.

Opportunity to influence shift plan design

In addition, compensatory aspects, such as ergonomic rest break design with the opportunity to take a nap, played an important role in the design of night work. The opportunity to influence shift plan design, as well as reliability and predictability, are relevant resources considering the background of more demanding social integration of shift workers. As shift work already constitutes a demanding working time regime per se, it should not be

additionally combined with other demanding working time features, such as high flexibility. High demands arising from the activity or high-risk activities should be avoided, if possible, or accompanied by specific measures of work organisation.

Despite the increasing flexibilisation of working time, weekend working hours are characterised by a high social value of time (social integration). Weekend working hours consequently should be avoided if possible. Compensatory time should be implemented as soon as possible.

Avoid weekend working hours if possible

With regard to mental health, rest breaks have a significant positive impact, as they permit recovery and stress compensation; they must be obligatorily integrated into the workflow. The specific design of rest breaks must take into account the work assignment in question, i.e. the type and degree of workload. In addition to the function of rest breaks (recovery vs. food intake/social contacts), aspects of work organisation and (organisational) culture must be taken into account in rest break design. Distribution and duration of rest breaks should therefore also consider the organisational processes. As already provided for in the Working Hours Act, the scope and the frequency of rest breaks can be designed, among other things, depending on working time. The phenomenon that e. g. high work intensity leads to rest breaks not being taken should be countered by a structural integration of rest break design and the establishment of a good “rest break culture”.

Establishment of a good “rest break culture”

For on-call duty/standby duty, clearly negative associations with mental health have been found; therefore, this form of working time should be limited as much as possible. There are only limited indications of the design of on-call duty in the context of the reviewed studies. They essentially relate to questions of predictability and influence options. Statements on the number of tolerable consecutive on-call duties, or within a defined period, cannot be clearly derived on the basis of the studies. In addition to the basic cause-effect mechanism, the question of frequency and type of utilisation, as well as the integration into existing working time regimes, are of significance here.

Predictability and influence regarding on-call duty

The state of scientific knowledge shows that the term “flexible working hours” includes very different working time regimes. Available design information here particularly refers to the planning and predictability, as well as to the opportunity to influence working time. On the basis of the available studies, a distinction can be made in this context, in addition to the working times already described above as well as on-call duty/standby duty, between variable working times with high and low design autonomy on behalf of the employee. Positive associations, particularly with the work-life balance, can be found for variable working times with high design autonomy. However, it cannot be excluded that employees are endangering themselves through the option to influence the design of working time. Variable working times without design autonomy are negatively associated with mental health and therefore represent an unfavourable design option (social desynchronisation).

Flexible working hours

Mobility requirements are an increasingly important factor in the design of working time. Different design requirements arise depending on the type of mobility. It has been shown that mobility – both on the job and job-associated – is very frequently linked to an increase in work-related time, thus reducing socially effective time. Different load constellations will result depending on the life situation, with the recommendations in this area predominantly aiming to reduce mobility requirements. For the area of on-the-job mobility, the additional requirement applies that the specific “travel conditions” should be the least stressful possible.

Mobility requirements

Work-related permanent availability

In addition to mobility, job-related permanent availability constitutes an essential factor with regard to the amalgamation of working time and rest periods. As a rule, availability is not included in the job contract and therefore a “voluntary” service provided by the employee. The recommendations essentially focus on the need for regulation. Regulations must be developed against the background of specific operational and individual requirements, including transparency, participation and justification contexts. This includes both perceived necessity and appropriateness (legitimacy). In those cases in which the employee is contacted merely as a consequence of bad planning or the delegation of tasks outside of the employee’s responsibility, availability is perceived as a rather illegitimate crossing of boundaries, with the associated negative effects.

Work-life balance and detachment (from work)

The available studies show that work-life balance and detachment are, on the one hand, directly negatively associated with the stress situation at work and working time design and, on the other hand, directly positively associated with various aspects of mental health. Regarding working time design, influence on working time design, as well as its predictability and planning options, have a positive impact on work-life balance. On the other hand, detachment is characterised, among other things, by the option to be able to put an end to a “work situation”. Employees must be afforded the opportunity to distance themselves from all aspects of work during rest periods. Good detachment is beneficial to recovery, i.e. the resetting of the consequences of stress caused by work, and is therefore a key element of recovery.

Relief phases

Working time regimes are, as a rule, characterised by the interaction of different individual factors, such as long working hours and weekend working hours. For this reason, the individual characteristic constellations are a focus in the assessment of working time regimes. For the assessment of a working time system, the featured design elements must be assessed also against the background of “pattern formation”. The individual working time features, the activity, the operational framework and the individual prerequisites are constituent elements. In general, the following applies: a high overall load must be balanced out by timely relief phases, e.g. longer recovery times. In the process, paradoxical incentives must be avoided, as employees will be quite ready to accept or even favour stressful working time constellations if the according reward systems favour this readiness, e.g. extra pay for permanent night work. This is equally true for the “key dimensions” of working time design, such as the concentration of working time on a small number of days in order to reduce commute time, as for the expansion of permanent availability in order to increase an individual’s chances of promotion.

2.4.3.3 Need for research

Although extensive research has already been conducted on many of the factors considered in the subject area “Working time”, there is still a need for additional research.

For instance, recovery and mental (as well as physical) regeneration to compensate for stress at work should be analysed more thoroughly in the future, as these outcomes are of high significance for the maintenance of employee health. The dynamics of stress and recovery must also be considered in this context, with a need to differentiate short-term effect dynamics from recovery on a daily and weekly level, as it must be assumed that the cumulative and compensatory effects of working time requirements and resources vary over the short and long term. This will also permit finding answers to research questions on the evolution of risks, e.g. which period recovery from shift work can no longer be effective. The interaction of working time factors with other working conditions, such as quantitative work requirements and work intensity or latitude for initiative and decision-making, should also be examined more specifically in order to be able to estimate short and long-term consequences of load constellations.

Cumulative and compensatory effects of working time requirements

In the past, research in the field of occupational science – very few exceptions aside – has been based on a strict separation of gainful employment and non-gainful employment. It is currently becoming more and more obvious that the analysis of the dynamics of working time and rest periods should increasingly focus on the point of intersection between the two spheres of work and private life. Coordination conditions (regulation conditions) in particular should be the subject of future research, in order to reach a better understanding of phenomena of the dissolution of borders and their impact. In the process, it is also necessary to include individual living conditions and resources in the research to a greater extent.

Point of intersection of the spheres of work and private life

Cycles of (work)load and recovery can only be adequately examined, however, if suitable methods, such as studies of development over time or diary studies, are applied. As little is known about the impact of combinations of loads, it will be important not to analyse individual stress factors and resources in an isolated manner, but in the form of reasonable constellations close to reality, which ideally should be transferable to a multitude of similar activities. However, design-related findings are still lacking for some areas or activities, as many of the available studies analyse similar professions, and it is not always possible to transfer the obtained findings directly to other activities (e.g. cleaning staff).

Realistic constellations of stress factors and resources

EXPERT DISCUSSION ON SUBJECT AREA “WORKING TIME”

The following notes and considerations resulted from the discussion:

- To do justice to the complexity of the subject area “Working time”, the dynamics of working time and rest periods, or of stress load and recovery, must be considered.
- Working time can generally be described by means of duration, time of day and distribution as well as flexibility and predictability; therefore it seems useful to consider patterns or feature combinations (working time regimes) here.
- The current guidelines, laws and recommendations regarding working time (EU Working Time Directive, Working Hours Act) are compatible with the available design knowledge on long working hours, shift/night work, rest breaks and on-call duty (for instance with regard to maximum daily and weekly working hours).
- Working time should be organised in the workplace by means of a participatory negotiation process in order to achieve maximum congruence between operational demands and the needs of the employees. In this context, the work-related wishes of the employees can change depending on the current phase of life (regarding the “social value of time”).
- The flexibility wishes of some employees in order to achieve a good work-life balance can turn into a flexibility demand for other employees.
- The design of working time should preclude misplaced incentives (e.g. bonuses) in order to prevent employees from engaging in behaviour harmful to themselves (for instance permanent availability as a means of promoting one’s professional career).
- Future research should examine the dynamics of working time and rest periods, applying realistic combinations of working conditions factors. The relevant individual factors of employees should also be considered in this context in order to enable statements to be made on the conditions for coordination of work and private life.
- Sectors and professional groups (cleaning staff, employees with an immigrant background, with limited education) for which only few findings regarding the health-related impact of working time are available so far, should be given more consideration in the context of research.

2.5 Subject area “Technical factors”

2.5.1 Description of working condition factors

In the subject area “Technical factors”, the working condition factors of (1) noise, (2) climate, and (3) light were examined as environmental factors, as well as (4) human-machine and (5) human-computer interaction. In the process, 839 (human-computer interaction) to 2,834 (noise) abstracts were reviewed. A minimum of 30 (climate) and a maximum of 122 (noise) publications were then included in the further analyses.

For the cooperation of people and technology in the industrial sector, a general distinction can be made between two areas. For instance, there are activities in production/assembly, in which people cooperate with machines or utilise machines for the manufacture of physical products. In addition, the increasing degree of automation in production environment contributes to machines and systems almost independently performing activities, while people take predominantly a monitoring role in this context. Accordingly, the consequences of work with machines and automated systems (human-machine interaction) for mental health will be analysed separately in production/assembly, and for control rooms and master displays (e. g. in energy generation).

Computers and visual display units have, however, assumed a central role not only in the industrial sector, but also for office work. Although the utilisation of computers with modern software, together with the associated input and output media, is intended to make office work easier, health impairment cannot be excluded. For this reason, it seems appropriate to examine to what extent the design of human-computer interaction and software, screen display as well as the dimensioning of the input and output devices make getting tasks done more or less difficult and which options employees have to influence the design of the means of production.

Human-computer interaction

Noise, lighting and climate are technical factors of the physical work environment which are associated with effects on the level of subjectively perceived well-being – such as feelings of annoyance, ease and comfort – already at levels of exposure significantly below existing limit or guideline value recommendations. It is of special interest for mental health in the working world how the working condition factors impact the working task, e. g. the consequences of background noise on different activities in an open-plan office.

Physical work environment

2.5.2 Current importance of working condition factors

Every employee is permanently exposed to direct and usually dynamic manifestations of noise, light or climate. In the first place, human sensitivity for the perception of environmental conditions serves to maintain physiological health, for instance by feeling cold or reacting to being dazzled. Due to the systemic link in the organism between physiological perception and information processing by the central nervous system, all perceivable environmental influences have, in principle, an effect on mental health. It is decisive to what extent an influence is consciously perceived and later assessed as positive, negative or irrelevant.

The determined prevalences of the working condition factors are based in this context on the so-called BIBB/BAuA Employee Survey (BIBB/BAuA, 2013). The participants were asked to estimate the frequency of occurrence of “noise”, “glaring light, poor or weak lighting” as well as “cold, heat, wet conditions, moisture or draught” – i.e. the negatively connoted manifestations of sound, light and climate. It must be considered that sound and lighting conditions and, to a lesser extent also the climate, can impact mental well-being without the person making a conscious assessment as “noise”, “poor lighting” or “cold”. In principle, for instance, also slight noises can impact concentration due to their quality, without the affected person perceiving the situation as noisy. With regard to lighting, the biological, non-visual cause-effect relationship shows that a subjective assessment cannot be sufficient for the clarification of the mental impact. The potential impact on the melatonin balance, for instance, cannot be directly perceived by humans. Therefore, no prevalences are available for these environmental factors: they cannot be operationalised in surveys.

The numbers from the employee survey below refer to manifestations of the environmental factors experienced as significantly negative and therefore include, in addition to negative mental perception, potential physiological hazards, although the survey did not differentiate between these two levels of impact.

Overall, 28% of those interviewed stated frequently being exposed to noise at work, 12% reported working under glaring, bad or weak light, and 25% are frequently exposed to cold, heat, wet conditions, moisture or draught.

The negative perception of these environmental factors varies significantly between sectors. Table 13 shows the three sectors with the highest and lowest perceived exposure to noise, respectively.

Table 13 Perceived noise exposure. Percentage of employees by sectors.

Source: BiBB/BAuA 2013

Noise	
Construction	44
Education	44
Manufacturing	37
Information and communication	18
Professional, scientific and technical activities	16
Financial and insurance activities	15

It is apparent that noise is a predominant problem for machine and physical work (see “construction” and “manufacturing”), with the highest risk of noise causing damage to hearing (see Table 13). However, the share of employees affected by frequent exposure to noise (44%) is equally high in the sectors of “education” and “construction”. In the construction sector, work situations with noise emissions causing damage to hearing are

frequent, while such levels are not usually reached in education. It must therefore be assumed that the perceived noise exposure in “education” is essentially due to noise levels caused by social situations. This assumption is made plausible by the fact that, in accommodation and food service activities, no less than 32 % of interviewees also stated frequent exposure to noise at work. The three lowest values represent sectors of knowledge-based and service work generally performed in offices. This kind of work typically involves situations without a necessarily “loud” environment due to technical or social factors. Nonetheless, with 15 % of those interviewed still reporting frequent noise, it seems justified to assume that the existing working conditions are unfavourably designed.

On average, 12 % of interviewees report frequently working under glaring, poor or weak light. This particularly concerns the construction sector at 23 %, as well as transportation and storage at 19 %, followed by human health and social work activities as well as non-knowledge-based service activities at 13 % each.

Lighting conditions

Cold, heat, wet conditions, moisture and draught are cited by 25 % of interviewees as frequently occurring working condition factors. The three sectors with the highest values (cf. Table 14) are construction, waste management and water supply as well as transportation and storage, which is presumably due to the fact that these activities are primarily performed outdoors.

Climatic conditions

Table 14 Poor climatic conditions. Percentage of employees answering “frequently” by sectors. Source: BiBB/BAuA 2013

Poor climatic conditions	
Construction	49
Education	41
Manufacturing	39
Information and communication	13
Professional, scientific and technical activities	12
Financial and insurance activities	11

See Table 15 for the percentage of employees working with machines, with computers, or with machines and computers. The data shows that only few professions remain which use neither machines nor computers for work. The degree of utilisation varies significantly, however. For instance, a machine operator spends most of the working time in direct interaction with the machine, while the utilisation of technical tools varies strongly in the different service professions. In addition, it must be considered that the interfaces of modern machines should also be assessed with regard to the design of human-computer interaction. The number of machines without computer-assisted controls is becoming ever smaller, which means that user interfaces are established which are essentially based on software and display technology, as with computers.

Prevalence of technical aids

Table 15 Work with machines and computers. Percentage of employees by professional groups. Source: BIBB/BAuA 2013

Work with machines and computers			
Professional groups	Typical work with machines	Typical work with computers	Typical work with machines and computers
Professions in agriculture, livestock production, forestry, horticulture	2		
Manufacturing professions, mining, mineral extraction	19.8		
Construction professions	3.8		
Technical professions			7.8
Merchants		11.5	
Transport professions	6.7		
Administrative, office professions		19.5	
Service professions			25.8
Total (rounding errors): 96.9	32.3	31	33.6
Other workers		3	
Not specified		0.2	

This fact is representative of the general importance of technological progress for the newly emerging requirements in the working world. The information processing capacities of machines and computers can be associated with high mental requirements for the understanding of the systems by the users. On the one hand, the design of user interfaces is increasingly simplified, making it unnecessary to focus on the more complex system functionalities; on the other hand, the professional use of these tools, in particular, requires an adequate understanding of the technological and informational contexts of the working system.

Overall, it can be found that the environmental factors, as well as the two technical factors of human-machine and human-computer interaction, are relevant for almost all jobs and activities.

2.5.3 Findings

2.5.3.1 Scientific evidence on working condition factors

The mental effects of technical factors are complex, even with good physical measurability. For instance, identical exposure can lead to different stress loads between individuals and in the same individual. In addition, the effects often do not arise directly, but are the result of assessments. Besides the individual characteristics of humans, the demands associated with getting a task done also take an important function in the impact of stress loads. Interactions with other influencing factors must also be considered.

In the examination of the impact of noise on mental health, aspects of experiencing disturbance or inconvenience feature predominantly below noise levels causing damage to hearing, which are becoming relevant for an increasing number of sectors of activity. Only few studies are available on this, however. The sizes of the effects on mental health are small to medium. The negative effect of speech or speech-like noises on the processing of a working memory task has been known for a long time. Although several studies have been conducted on the effect of noise on the cardiovascular system, it still seems problematic to speak of a verified association. The specific dependencies between noise and mental health in the workplace have been rarely examined overall in the reviewed studies, although it stands to reason that noise is a stress factor. Noise causes disturbances and interruptions of work which are perceived as stressful. It has been verified that noise occupies cognitive resources, which can only be compensated for by increased effort in the best case. As a stress factor, noise has been rather thoroughly studied in the field of environmental psychology, although the findings cannot be transferred to the working world. Overall, noise – below parameters and limit values causing damage to hearing – is to be considered a significant stress factor with a negative impact on well-being, performance and on social experience and behaviour (cf. in extenso Liebl & Kittel, 2016).

Noise

The lighting in the workplace can also have an indirect impact on mental health. The determined effect sizes are consistent, but rather small numerically. Unfavourable lighting conditions can cause mental stress complicating the perception, processing and conversion of visual information. In this case, we speak of visual discomfort or visual fatigue, states which can be associated with asthenopic symptoms (e.g. eye irritation, increased photosensitivity, headaches). Despite a long tradition of research, the search for reliable measures of visual fatigue is still affected by methodological problems. The causes of such symptoms are often poor lighting conditions, e.g. flickering, low contrast of visual symbols, or veiling reflections on displays. In the literature, it is debated to what extent visual contact with the outside supports mental health in a broader sense. For instance, windows can support eye health by offering compensation for close focussing during screen work and countering monotonous lighting conditions through the dynamics of daylight.

Lighting

Light intensity, spectral composition and light distribution are classified as non-visual effects of light. The activating effect of bright lighting refers to cognitive effects of attention, executive function and memory capacity. Overall, the studies permit the conclusion that the increased association with intense lighting as well as an increased attention do not only increase visual performance, but work performance in general. Similarly acute effects of light exposure are found in the effect on the cardiovascular system. The importance of non-visual

Non-visual effects of light

effects for mental health, however, is primarily concerned with how well the internal clock and the associated circadian rhythms can adapt to a stable daily 24-hour light and darkness cycle. Desynchronisation is associated with mental disorders, whereas successful synchronisation goes along with positive effects on vitality and mental health. In the medium to long term, lighting conditions therefore can have an influence on the circadian rhythm and on well-being. A positive trend can be found between light exposure during the day and quality of sleep, or the time required to fall asleep. Conversely, light exposure with a higher share of blue light in the evening and at night is associated with worse sleep and disturbance of the internal clock. Impairment of the circadian rhythm corresponds with deteriorating mental well-being and physical health risks, while further impairment of mental health cannot be excluded. Overall, lighting conditions not corresponding to the visual requirements inherent to the tasks, and therefore contributing to fatigue and impairment of information processing, represent stress factors negatively impacting general well-being and mental load, but of rather minor importance for mental health (cf. in extenso Krüger, 2016b).

Climate Generally, a comfortable thermal room climate is intended in the workplace, particularly in offices and other areas. During the heating season in particular, employees in office areas suffer from symptoms like burning eyes, dry mucous membranes or itchy skin. In addition to the physiological effects, this can be indirectly associated with a mental load. The causes of these symptoms due to dry air appear to be multifactorial in nature and are controversially debated by experts. An unchanged climate over a longer period (lack of stimuli) or the perception of being unable to influence the room climate in the workplace (“perceived control options”) have a negative impact and lead to complaints and dissatisfaction, and therefore to reduced motivation and job satisfaction. Overall, the climatic conditions do impact the perception and the behaviour of the affected persons as stress factors, but the experience of room climate varies between individuals and in the same individual. It is known from climate research, however, that the perception of the room climate, particularly in the comfortable thermal range, also depends on expectations, experiences, bias or group dynamics. The direct impact on mental health reported in studies – particularly compared with the other working condition factors – is low. In addition, the findings indicate that an important function is assumed by the “possibility of individual control” of the room climate. Within the generally accepted range of comfort, however, the potential for improvement of mental well-being must be assessed as low (cf. in extenso Bux & Polte, 2016c).

Human-machine interaction Machines, computers or robots have an impact on humans by means of interaction. Studies on human-machine interaction show that an increasing degree of automation and a higher level of automation can reduce the subjective stress load. The available studies do not permit any statements on the long-term consequences of the stress load, however. The obtained findings indicate that the principle of function allocation as the reduction of a resource (e.g. limitation of autonomy) or as an additionally available resource (e.g. capacity extension) can change the latitude for initiative and decision-making of the operators. Aspects of operation can also have an impact on other features of the working task and of work organisation (e.g. time and method control). With regard to interface design, the existing knowledge on the advantages of ergonomic design are confirmed. Particularly the functional and redundant presentation of information, as well as the application of existing design principles, are associated with increased user satisfaction and performance benefits, although the outcome of the review does not allow any certain statements on the impact of interface design on job satisfaction and motivation. In the area of machine and systems operation, a negative effect

of medium size on mental health and intrinsic job satisfaction can be found for the close interconnection with technology. More reliable systems are associated with higher performance and strong confidence in the system (cf. in extenso Robelski, 2016b). Relatively few studies exist on the association between human-computer interaction in the office and mental health, well-being, motivation/job satisfaction as well as performance; the available studies primarily focus on sub-aspects of design, and frequently only with regard to performance. Consistent statements are only rarely possible, however, due to different operationalisations. Despite the significant research tradition in the area of human-technology interaction regarding human-centric design, it is almost impossible to derive any generalisable insights on the impact on mental health (cf. in extenso Höhn et al., 2016b).

Human-computer interaction

2.5.3.2 Design

The design of “technical factors” permits avoiding unfavourable consequences of stress, such as monotony, permanent attention or the transfer of residual tasks. It is difficult to derive any specific, precise design on the basis of generic rules, which means that operational process issues and participation processes are gaining in importance.

The studies focussing on noise include a number of interventional studies demonstrating the effectiveness of manipulations of speech intelligibility regarding performance and mental well-being. This includes typical measures of building and room acoustics, such as the utilisation of highly absorbent ceilings or specific furniture (e.g. partition walls), on the one hand, while also extending to a targeted increase of the background noise level (e.g. by means of sound masking) on the other hand. The options of impacting speech intelligibility appear limited, however. For instance, there are limits to increasing the background noise level in a room, as otherwise the masking signals themselves will be perceived as stressful. Individual sector-specific studies are available for the health sector, which are reporting, for instance, the successful reduction of stress indicators in surgeons, as well as postoperative complications due to behaviour-related and technical measures in surgical theatres. These measures range from the reduction of alarm volume to specific instructions on how to handle technical equipment, such as suction devices. Overall, it should be noted that, in particular, the design measures taken to positively impact extra-aural effects of sound are complex. In addition, the situational features of building physics and those specific to certain activities are always relevant.

Language intelligibility

In the area of visual effects of light, the essential aspects of the prevention of eye symptoms in the planning of lighting and the design in an operational context have been considered in the existing regulations. The availability of daylight and visual contact with the outside are basic design elements for lighting. Other design notes were not found empirically. Some authors recommend that it should be possible to open daylight openings such as windows or roof skylights, that workplaces should be supplied with a high level of daylight (mean vertical illuminance greater than 2,000 lx) and should be equipped with adjustable sunshade systems allowing the employees to control the supply of daylight in interior spaces themselves. The notes have not conclusively been confirmed by empirical findings, however. Individual adjustment options can contribute to an improvement of latitude for initiative and decision-making, thus acting as a resource. It should be considered in this context that employees, provided with individual adjustment options, may potentially choose lighting settings which are not conducive to visual comfort. For this reason, it can be useful to technically support employees in their selection of lighting conditions. Specific design recommendations for the stimulation

Lighting, daylight and visual contact with the outside, individual adjustment options

of non-visual dynamics are found in many current research project, although their outcomes have not yet yielded any specific planning and application recommendations.

**Control options
agreeability criteria**

Fundamental design statements on the working condition factor of climate can be found in the existing regulations. To the extent that mentally relevant aspects, such as satisfaction, well-being and performance, are to be regulated, an adaptation of the individual climate factors in the Technical Rules to the agreeability criteria regarding the room climate and the regulation of the control option would have to be carried out. A perceived high degree of control could positively impact the assessment of the room climate, but any impact on mental health in a narrower sense should not be expected.

**Options for influencing the
working task, feedback,
degree of automation**

Criteria for the assessment of human-machine interaction as well as for its design are found in a multitude of statutory and sub-statutory standards. However, the state of scientific knowledge shows that numerous further specific aspects of human-technology interaction, such as function allocation, task design or different system characteristics, are relevant in the context of design for mental health. It is therefore required, for the working task, to create a sufficient amount of influencing options (also in the production process) to involve operators, in case of failure of automated systems, in the decisions as well as the selection and implementation of actions and, in doing so, to avoid a potential “lumberjack” effect. In addition, the design of feedback should take into account that the direction of the feedback (negative, positive) can impact the mood of the users, and that the communication of feedback by computer-based agents can be associated with a reduction of frustration. In the design of human-machine interaction, the process of selection of the type or the degree of automation and the subsequent selection of an automation level is also essential for good design. It is important, in this context, to also consider the mental and physical stress put on the operator. An iterative process involving the continuous adaptation of the design can be implemented to derive effective and efficient concepts for human-machine interaction.

**Compliance with existing
guidelines, consideration of
interaction between technical
implementation and user-
oriented outcomes**

Software design plays a central role in human-computer interaction in the office, i.e. in service and knowledge-based work. Software design primarily focuses on design aspects such as feedback, menu design or error management. For hardware, input and output devices, the design recommendations on the one hand refer to the design of the devices themselves (e.g. of keyboards or pens), but also on their suitability for the fulfilment of working tasks at the computer (e.g. for data input) on the other hand. Language dialogue systems can often be recommended as a supplementary system. Verified design knowledge is, however, limited to individual subfeatures of the design of software or of the input and output devices. Generally, the existing recommendations from the known standards (DIN EN ISO 9241-210, DGUV Information 215-410: DGUV, 2015) can be confirmed; these are partly even exceeding the findings. Overall, it is justified to conclude that observing this design information can lead to better well-being, higher motivation, job satisfaction and better performance. In more complex systems, it is difficult to derive generic design recommendations, as there are numerous cause-effect relationships between the features of technical implementation and user-oriented outcomes.

2.5.3.3 Need for research

In the research area of technical factors, the state of scientific knowledge referring to complex associations must be described as low overall. Deficits exist on all relevant levels, i.e. on the method, outcome and implementation level.

A harmonisation of the study approaches is required in order to allow more reliable statements on the extra-aural effects of noise to be made. This means that either comparable operationalisations of the predictor and criterion variables must be established or methods must be developed in order to transfer these different variables into a comparable dimension. This particularly requires an intensification of interdisciplinary cooperation considering engineering, medical and psychological aspects. Currently, only few verified insights are available (a) on the clarification of the association between subjectively perceived noise exposure and physical measurement parameters, (b) on the impact of noise on social behaviour, e.g. on social support, (c) on the impact of noise in the context of non-cognitive tasks, (d) on the importance of noise exposure in the context of free choice of workplace, e.g. for knowledge-based and service work in a café or on a train, (e) on age-related effects, and (f) on the development of methods for the assessment of noises and work environments.

Consideration of technical, medical and psychological aspects

Regarding the association of lighting and mental health, there is an increased demand for research in the subject area of biological darkness and their importance for mental health and performance. There are unanswered questions regarding the vertical illuminance required for the stimulation of non-visual dynamics. The prevalence and the impact of biological darkness must be further examined accordingly.

Impact of biological darkness, long-term consequences of non-visual effects of light

Most of the documented non-visual effects of light have been verified during nighttime. During the day, they seem to be non-existent, or only effective to a significantly smaller extent. In addition, the importance of light history – i.e. the retroactive effect of previous light exposure on mental and physiological parameters at times following the light intervention per se – is largely unknown. Particularly in the context of the use of technology to support performance, the potential long-term impact of non-visual effects of light on health should be studied. For the visual effects of light, daylight and visual contact with the outside, among other things, are intensely debated in the context of the Workplace Ordinance. Empirical evidence is still insufficient, however.

With regard to climate, there is a need for research, among other things, on the design option of “perceived control” in overheated buildings with a high share of glass surfaces: the impact on mental health and performance, as well as the potential development of protective measures focussing on operational requirements, should be examined here. The new utilisation of devices for individual climate control is promising, but few studies have addressed this so far. In addition, the advantages of climate design focussed on agreeability and the identification of options to eliminate climate-related stress factors should be examined in more detail.

Perceived control

For both human-machine interaction and human-computer interaction, the initial focus should be on reviewing the available knowledge from experimental studies. There is a further need for research on the question whether existing interface and interaction concepts can also be transferred to working with new technologies. It should be reviewed in this context which working tasks are actually suited for the utilisation of new technologies. The technology-centred perspective and the orientation towards technological aspects of the human-

Transferability of existing interface and interaction concepts to new technologies

Human-machine cooperation
and task design

machine system, which is also reflected in the Industry 4.0 approach, should be considered in more holistic manner. The examination of the comprehensive interaction between the technology-related change in tasks, particularly regarding function allocation, the resulting design features and the dependent variables, as well as the varied interaction, represents the central challenge to future research work. It seems that particularly the association between the desire for control activities, confidence in systems, annoyance, stress load and performance has not been sufficiently elucidated by the available studies. The human-robot interaction is associated with new conceptual questions; these concern, for instance, new forms of the division of labour between humans and machines, decision support, transparency, clarity and acceptance of interaction concepts, or also the potential benefits of anthropomorphic design. In particular, the aspects of the division of labour between humans and machines and of the design of tasks should be associated with the allocation and perception of responsibility within these new kinds of processes. The questions of task design and assumption of responsibility are usually associated with group and team structures in companies, the manifestations and dynamics of which should be considered particularly in association with changing technological processes.

EXPERT DISCUSSION ON SUBJECT AREA “TECHNICAL FACTORS”

The following notes and considerations resulted from the discussion:

- A design of the physical environmental factors (lighting, climate, noise) that is adequate for the activity does not necessarily increase employee satisfaction, whereas deficient design contributes to dissatisfaction.
- Regarding the factors of the physical work environment, individually available regulation and control options (e.g. of workplace climate) have an impact on the well-being of employees, making latitude for initiative an important design feature in this context.
- Due to the flexibility and continuous evolution of technical systems and the interaction with other working condition factors, the formulation of comprehensive specific design measures is difficult, although the existing design principles are still valid.
- Innovative technology usage widens the choice of options for differential work design, for instance by means of the individual adaptability of user interfaces or assistive technologies, such as voice input.
- Participatory work design, i.e. involving work design experts and employees, can contribute to the development of work design solutions which do not impair health, not only over the short, but over the long term.
- The continuously increasing complexity of technical systems means that they are no longer transparent for employees, potentially leading to a loss of expert knowledge in case of a high degree of automation and resulting in an inadequate response to malfunctions.
- Standards for a good design process should be developed in addition to the preparation of condition-related criteria.
- For new technologies, the design objectives should not only be concerned with the preventions of risks and hazards (e.g. prevention of monotony), but should also take into account positive aspects, such as existing opportunities for learning, or options for the support of employees with impairments.
- The change in the working world will lead to further increasing mechanisation and automation, making human-technology interaction more and more significant in an increasing number of sectors (e.g. usage of robots in the healthcare sector).
- Questions regarding responsibility issues when working with robots should be addressed in the context of research.

2.6 Subject area “Design approaches”

A primary objective of the project Mental health in the working world – Determining the current state of scientific evidence” is to contribute to the design of humane working conditions. Due to this central importance, interventional studies were therefore additionally reviewed and assessed for the project. In addition, another expert discussion was held on the subject of “design approaches”, in which key design statements were initially gathered for each of the four subject areas, discussed and added to, and then summarily considered. To begin with, findings from the assessment of the interventional studies are reported below. This is followed by a presentation of the insights from the expert discussion.

On the basis of the reviewed literature, it has been found that, although a variety of statements on design are available, these insights require critical reflection in several respects and need to be supplemented. For the purposes of the project, a distinction is made between design knowledge, design recommendations and design information (cf. Section 1.2):

The number of high-quality, controlled interventional studies from which design knowledge can be derived is rather limited in the individual subject areas. To supplement the literature searches on the individual working condition factors, the insights of which are presented in the scoping reviews, interventional studies on comprehensive design approaches and principles were examined in an additional literature search. Overall, an additional 73 interventional studies could be identified and assessed.

Interventions

A general distinction can be made here between interventions focussing on people (i.e. behavioural) and interventions focussing on organisations (i.e. relational) as well as combined methods (Semmer, 2010), although the large majority of studies focusses on behavioural interventions. Bamberg, Busch and Ducki (2003) distinguish interventions as follows:

- Condition-related (relational) interventions, e. g.
 - Work design (job rotation, job enlargement, job enrichment, group work)
 - Temporary, objective-focussed forms of work, e. g. health circles
- Interventional methods focussing on the individual (behavioural), e. g.
 - Training of problem-oriented coping strategies (social skills training, problem-solving, time and self-management)
 - Training and coaching of managerial staff
 - Training programmes of cognitive behavioural therapy, stress immunisation training
 - Relaxation training
- Integrative interventions, e. g.
 - Resource-focussed programmes
 - Stress and resource management for work groups
 - Organisation-wide survey feedback programmes

The state of scientific knowledge shows that organisational interventions are significantly less frequently subject to systematic examination than interventions on the individual and on the individual-organisation level. Reasons for this are presumably that individual measures are easier to implement, as well as more cost-efficient, and cause less disruption of production

processes and work routines, therefore often meeting with higher acceptance by the management (Busch, 1998; Murphy, 1995; Sauter et al., 1999).

Against the background of frequent transformational processes in companies, the required operational stability is often also lacking, which makes longitudinal studies more difficult (Mattila et al., 2006; Mikkelsen, 2005; Taris & Kompier, 2003). In addition, comprehensive outcomes regarding mental health, such as those considered in the context of this project (e.g. mental disorders, impact on the cardiovascular or musculoskeletal system), have been so far less often the focus of attention than outcomes in individuals (e.g. recording of experienced stress, measurement of direct learning progress with the goal of training; cf. Kompier & Cooper, 1999; Giga et al., 2003).

Considering the insights from studies on condition-related interventions (focussing on organisations), it is found that only very few studies report negative (adverse) effects of intervention, although there is often no evidence of the expected positive effect either. The short duration of the interventions (often only a few weeks) and the very short intervals between the end of the intervention and the follow-up are stated as reasons for this. Participation of the employees in interventions is reported in the literature as the key to success and a precondition for good and particularly for sustainable outcomes (e.g. in Karasek, 1992; Bamberg, Ducki & Metz, 1998; Parkes & Sparkes, 1998; Kompier & Cooper, 1999). The problem with such approaches is, however, that it sometimes remains unclear if the resulting improvement has been caused by the intervention or is due to participation-related factors. Then again, it is the nature of participatory measures to not only aim to change a single working condition, but to understand an intervention as systemic, in terms of the interaction of different components of the work system.

Condition-related
interventions

Individual measures and training are among the well examined interventions. On the one hand, the available findings show that primarily problem or resource-oriented approaches focussing on the individual in order to strengthen personal skills will lead to success, as will the training of managerial staff in particular, as leadership tasks and behaviour can have a major impact on employee health (Rigotti et al., 2014). On the other hand, it has been found that the outcomes of these studies are often measured soon after the training, so that insights on the longer-term effectiveness of the measures with regard to mental health in particular are lacking.

Behaviour-related
interventions

The contribution of preventive behavioural approaches to mental health should nonetheless not be underestimated. For instance, several studies agree (e.g. Murphy, 1995; Sauter et al., 1999; Bamberg & Metz, 1998; Mohr & Semmer, 2002; Semmer, 2006; Zapf & Dormann, 2001) that the traditional dichotomy between relational and behavioural preventive approaches is not very helpful for practice-oriented design in the workplace. A multidimensional approach is recommended instead, which considers factors related to individuals and conditions and combines them.

Integrative
interventions

In the context of the occupational science debate, so-called organisational resilience represents a relatively new design approach. Resilience is modelled by many different working condition factors and their reciprocal influences, with the organisational design principles aiming to make an organisation more “resilient” towards a dynamic environment in the sense of “adaptable”, so that safety and productivity are maintained (cf. Hartwig et al., 2016b).

Major design challenges

In addition to the discussion of individual factors, the following central theses were presented and extensively debated in the expert discussion. In the process, the discourse on design showed that it is well possible to derive general conclusions, but implementation needs to be context-specific. The following insights represent major challenges to the design of work that is conducive to (mental) health.

- Work design is systemic and must consider load constellations. Key factors of the system must be designed in a way that is beneficial to health. Not all elements of an overall work system are equally important.
- Access points or levels of design differ in their focus regarding the various working condition factors.
- Load thresholds in the context of risk assessments are partly difficult to define on the basis of accepted criteria or metrics. Established methods and criteria for assessment could only be identified for a small number of factors.
- Behavioural prevention in terms of the strengthening of (individual) personal resources and skills is becoming more important due to structural changes in the working world in relation to conditional design. Some factors can only be designed effectively if individual skills are considered and promoted accordingly. For instance, extended latitude for activity at work is only beneficial if the associated skills needed to benefit from the latitude are developed simultaneously.
- Workplace design is always specific and should comprise analysis, assessment, design and evaluation at all times. To the extent that sufficiently verified methods and assessment criteria for the design of factors in the workplace are not available, the systematic iterative approach is becoming more important. Process knowledge for design is therefore of similar importance in workplace practice as the knowledge of design criteria.
- Design requires comprehensive participation processes. For workplace design, both the design knowledge of the employees and the subjective experience, i.e. the inclusion of the employee perspective, are of general importance. At the same time, participatory processes cannot replace the required expert knowledge. A special challenge in the workplace is to combine participatory assessments and expert judgements properly.
- A central objective of work design is to avoid any danger to mental health. The promotion of resources (e.g. creation of latitude for initiative and decision-making, social support) offers many chances for good work design here – although it must not replace an assessment of the risks.
- Recognition and handling of the complexity of mental influencing factors in work systems can quickly pose too much of a challenge in workplace practice. Businesses should be enabled to recognise the most important risk factors and to improve them if possible. It is important for businesses to translate verified insights for practical use. It is therefore important that recommendations, standards and regulations are comprehensible.
- Particularly against the background of a changing world of work with an increasing complexity and dynamics of many work situations, the ability to (collectively) design work must be developed and systematically promoted to a much larger extent than before. A prerequisite for this is and will continue to be, however, that the current framework conditions in the workplace generally enable and support humane work design.

EXPERT DISCUSSION ON SUBJECT AREA “DESIGN APPROACHES”

The following notes and considerations resulted from the discussion:

- Design at the organisational level and design at the individual level must not be considered in opposition to each other, but as integrated into a comprehensive view. For instance, adequate latitude for initiative and resources can be provided at the organisational level which enable individual work design.
- For the adequate utilisation of their design options, however, the employees require skills permitting the professional handling of stress loads. Work design should therefore also include qualification, while relational and behavioural prevention should complement one another.
- Workplace design processes should ideally be participatory, with employee involvement and expert knowledge complementing one another. Standards of good design practice could be formulated here.
- Leadership should support employees in the good design of their own work. For this purpose, managerial staff should be taught the appropriate skills and should be afforded latitude to fulfil this task.
- For humane work design with regard to mental health, abstract objectives should be formulated, which are specifically interpreted and implemented and can be supplemented with design principles. Best practice examples can be used to specify these further.
- Health-related, empirically verified design knowledge is currently under-represented in research. Design research should be intensified with a focus on the evaluation of measures, processes and holistic assessment of outcomes.

2.7 Subject area “Mental health”

In the context of prevention – as a design principle – three approaches/levels should be distinguished. Primary prevention aims to prevent damage, i.e. prevent diseases from forming; secondary prevention focusses on the limitation of damage, i.e. the early detection of diseases and the prevention of chronification; and tertiary prevention strives for damage revision, meaning the limitation of relapses or complications.

Primary prevention Primary prevention measures can be applied relationally – meaning in a condition-related manner – i.e. they can consist of a change to technical, organisational and social working conditions in order to achieve a reduction of existing stress factors or the strengthening of resources. In addition, behavioural measures focussing on the employee are also possible, such as training, instruction etc.

Secondary prevention Secondary prevention means, on the one hand, raising the awareness of businesses on the issue of mental health in a narrower sense, particularly regarding mental disorders, in order to overcome prejudice and reservations and to foster understanding of health differences between individuals, so that an overall certainty of action can develop. In addition, the instruments of secondary prevention include, among other things, preventive occupational care, with a general distinction between mandatory, optional and individual prevention. Preventive occupational care provides the opportunity to follow up on the interaction between mental load and health by talking to a doctor and, in doing so, to obtain further starting points for a risk assessment. The elicitation of the case history, including the work history, in the context of preventive care can include a conversation on noticeable mental symptoms and the mental load of the employee. It should be taken into account in this context that the risks posed by mental load often only become obvious because of symptoms, the individually perceived stress load consequences or medical findings deviating from the estimations of occupational science. In the ensuing consultation, the company physician can point out design approaches, i.e. measures for the prevention of mental load, but also by means of coping with stress. If necessary, the company management will receive feedback by the company physician in anonymised form on assumed, but also on overestimated risks in the workplace (DGUV, 2014; AMR 6.4).

In addition, performance indicators available in the company, e.g. on working capacity, or the results of employee surveys are also suitable for workplace monitoring. The context of data elicitation must be considered in each case in order to avoid misinterpretation.

The recommendation of the Committee for Occupational Medicine “Mental health in the workplace – Occupational health recommendation” discusses types of symptoms (BMAS, 2016). In this context, the AfAMed could be asked to look further into the pathologies and the diagnostic criteria. These deliberations must also consider ethical questions regarding a mental health screening of employees.

Early indicators of health impairment A good way to combine secondary and primary prevention would be to initiate work design measures in a timely manner on the basis of early indicators of health impairment. The company physician can contribute to competent clarification of mental stress loads and the working condition within the company (cf. ASiG). Although the findings of the scoping reviews demonstrate that the outcome variables feature multiple associations and interactions

regarding the working condition factors, therefore lacking the necessary specificity for the targeted derivation of design measures, a trained company physician can still elicit specific causes on an individual-case basis. The interaction between individual disposition and stress load on the job also plays a role here. Although, vice versa, the broad impact of the working condition factors on health indicators increases the number of design options, it must still be considered that it may be difficult to assess the effectiveness of measures even in individual cases due to the varied interaction of factors.

Tertiary prevention includes measures of medical and professional rehabilitation or benefits for participation in the working world, with the goal of maintaining work and employment capacity as much as possible in case of existing health impairment, disease and/or disability, to prevent a deterioration of symptoms and additional complications. The objective is to prevent affected individuals from exiting the working world. The legal basis for occupational integration management is Section 84, Subsection 2 of the German Social Security Code, Volume IX (SGB IX). Accordingly, occupational integration management is a statutorily regulated search process with the objective of maintaining or creating employment. It must be taken into account that professional reintegration (also: return to work; RTW) is a process which requires networking between a multitude of actors. In addition to the employee, this means actors on the company level, such as employers, stakeholders, the company physician, superiors and colleagues on the one hand, and actors on the medical-therapeutic level, such as the general practitioner, medical specialists and rehabilitation institutions on the other hand. Close cooperation and networking between these actors will benefit a successful return to work. The sufficient professionalisation of the coordinating and supporting RTW experts is a necessary prerequisite in this context. The (timely return to) work has a positive effect on disease management if the work is humanely designed. This aspect emphasises the necessity of a work design with the objective of reaching a good fit of individual, social and operational work demands. Social support by superiors and colleagues in particular is a decisive factor for a successful return to work by the affected persons. If the return to work is integrated into comprehensive health management, tertiary prevention can provide stimuli for primary and secondary prevention. It should also be considered that the demands towards employees should be neither too high nor too low. In addition, an unnecessary pathologisation of employees should be avoided, as the definition of illness and of specific diseases depends on societal expectations and is therefore not stable in itself.

Tertiary prevention

With regard to the status of suffering from an occupational disease, it should be noted that a disease is considered to be an occupational disease if it is caused by a specific impact as determined by insights of medical science, and to which certain groups of persons are exposed to a significantly higher degree than the general population due to their activity (Sec. 9 SGB VII, Occupational disease). On the one hand, this requires sufficient scientific evidence supporting a causal relationship between a specific working condition factor and the disease in question. For such evidence, cross-sectional studies are insufficient and longitudinal studies are required. On the other hand, the group of persons must be additionally specified for which a significantly higher risk of disease must be demonstrated, and a dose-effect relationship would ideally have to be derived. It will currently be difficult, however, to fulfil the requirements regarding the clarity of the findings (e. g. insights on mechanisms of action, independence of measurements, follow-up studies) commonly laid out in the statutory provisions on occupational diseases. The currently available findings therefore permit neither any conclusions regarding the specific impact e. g. causing a depressive disorder, nor any

Criteria for the status "occupational disease"

statements on groups of persons exposed to certain working condition factors to a significantly higher degree than the general population. Although the reviews demonstrate findings on associations between working condition factors and mental disorders, the BAuA is of the opinion that the current state of scientific knowledge does not allow a recommendation to be derived that the Medical Council of Experts on “Occupational Diseases” should focus on the subject area of mental load and e.g. depressive disorders.

Influences on the prevalence of mental disorders

The state of scientific knowledge generally shows that the 12-month prevalence of mental disorders has remained almost unchanged over the past years (Robert Koch Institute, 2015). For instance, the 12-month prevalence of depressive disorders is approx. 6% in men and approx. 13% in women (Jacobi et al., 2014). Any difference in the reported prevalences is, on the one hand, due to changes in disorder classification systems. For instance, the number of disorder categories in the Diagnostic and Statistical Manuals of Mental Disorders (DSM) has increased, between its initial publication in 1952 and the DSM IV published in 1994, from 106 to over 190. On the other hand, this is also associated with a change in the diagnostic criteria, e.g. for “depressive disorders”. For instance, the so-called Feighner criteria dated 1972 (Feighner et al., 1972) required that a depressive disorder should be assumed if the patient displayed five out of eight major symptoms (loss of appetite/weight loss, insomnia, loss of energy, restlessness or slow-down of psychomotor functions, loss of interest in usual activities, feelings of guilt, reduced ability to think and concentrate, suicidal thoughts), with the symptoms persisting for at least one month. According to the most recent edition – the DSM V (American Psychiatric Association, 2013) – it is only required that the symptoms manifest themselves over a period of at least two weeks, while longer periods of mourning are no longer explicitly excluded from the disorder conditions. The (12-month) prevalence estimates for mental disorders also vary with regard to their intensity (DSM IV: American Psychiatric Association, 2000; Federal Health Survey 1998: Bellach, 1999; Wittchen et al., 1999) depending on how the individual disorder categories (major depression, dysthymia) are subsumed into superordinate groups (e.g. affective disorder). In addition, the utilised diagnostic procedure (e.g. PHQ as a self-assessment questionnaire, Composite International Diagnostic Interview – CIDI as an interview) also impacts the determined frequency of depressive disorders (Busch et al., 2013).

Number of granted disability benefits and sick leave days

Overall, there is currently no empirical evidence indicating a change in the prevalence of mental disorders. However, these findings contradict the increase in disability benefits granted due to a mental disorder, as well as the rise in sick leave days due to a depressive episode over the past few years (Schütte & Köper, 2013). A change in attitude towards mental disorders (e.g. loss of stigma) is discussed as one cause of the increase in claims of health and social security benefits (Angermeyer et al., 2013). In addition, the expectations of the patient and of the attending health professional regarding the consequences of a diagnosis (e.g. reduced earning capacity due to a depressive disorder) represent another potential influencing factor. A better detection of the mental causes of physical symptoms is also possible. One hypothesis says that the demands arising from change in the working world require a performance capacity not all employees can provide.

However, the increase can also be explained by conditions inherent to the healthcare system, such as a change in the diagnosis options in outpatient care, making it easier than in the past to detect mental disorders (Jacobi et al., 2002). Another possibility are health-economy effects (e.g. different reward systems as a consequence of diagnosis-related groups or the regional availability of certain therapies).

It also cannot be excluded that a shift in diagnostic criteria – as is evident in the DSM V – inappropriately increases the share of individuals suffering from mental disorders, leading to a pathologisation of society and, consequently, of the workforce.

EXPERT DISCUSSION ON SUBJECT AREA “MENTAL HEALTH”

The following notes and considerations resulted from the discussion:

- Activity-specific stress factors cannot always be prevented. In such a case, coping with the stress factors – also through the utilisation of work-related resources – should be of prime concern.
- Regarding the issue of mental load, the involvement of the employees in the context of occupational safety is particularly important, but they also need the relevant skills for this.
- Existing systems of primary, secondary and tertiary prevention should be utilised in a more systematic manner than before to prevent mental impairment and maintain or promote mental health.
- Individual preventive care provides employees with the opportunity to consult the company physician if they think that there is an association between a health impairment and their work. This also applies to work-related mental problems.
- The company physician can contribute to the early detection of impairment of mental health, e.g. by offering voluntary consultation hours.
- The subject area of the working world is not always afforded the required attention in diagnosis and therapy. A stronger integration of the subject area of work into the professional training of psychiatrists, physicians and therapists would be desirable.
- Company physicians are not always systematically involved in return-to-work processes. The persons concerned should know about the option to involve the company physician and should be enabled to do so. If the employees of a company are cared for by an external physician, the contractual arrangements should provide for this accordingly.
- It should be possible to implement design processes beneficial to health in the workplace without the need for external expert knowledge. Those in charge of design as well as the social partners in the workplace should be made aware more strongly about their direct impact as actors.

3 Overview from a scientific perspective

3.1 Summarising statements on interdependencies and scientific evidence

In view of the summarising observation of the findings, it becomes clear that the working condition factors are not only based on definitions with a varying degree of ambiguity but also that the sophistication of the respective theoretical models diverges heavily. While some factors refer to established constructs in occupational science which have clear definitions (this applies for many factors of working time and technical factors, e. g. shift work, atypical working time, noise and lighting), other factors are currently less precisely defined, among them are also those which are increasingly discussed in the context of the changing world of work (e. g. work intensity).

In the majority of the studies included in the scoping reviews, the working condition factors and the outcome variables were recorded by means of self-reporting: Only a few studies make use of third-party assessments (for instance diagnostic interviews) or objective data (for instance register data). Even if, through this, it cannot be completely excluded that the results are also impacted by the interviewing method itself, this does not necessarily mean that the correlations between the independent and dependent variables are thus significantly exaggerated, i.e. subject to a common method bias (CMB) (Meade et al., 2007). With self-reporting, distortions occur due to different sources – such as the mood of the interviewees, the sophistication of the rating scales, the tendency to provide the socially desired answers or the simultaneous assessment of the working conditions and the health-related consequences by the respective employee. However, these possible impacts can be countered with a corresponding design of the interviewing instruments and the study design (Podsakoff et al., 2003), so that valid and reliable data can indeed be gained with such methods.

What is striking is the often heterogeneous operationalisation and measurement of the recorded variables. Additionally, for almost all factors, it is true that the spectrum of applied interviewing instruments ranges from self-developed single items up to established, frequently used and validated scales; here, the procedures used in most studies correspond to the minimum measurement precision demanded as per DIN EN ISO 10075-3. Altogether, however, for many of the included working condition factors – e. g. the work intensity, the social climate or the flexibility of working hours – well operationalised measurement procedures are missing.

Recording of the working condition factors and the outcome variables on self-reporting

Heterogeneous operationalisation and measurement

Despite the restrictions connected to the use of interviewing instruments, it is to be taken into consideration that such methodical procedure for collecting working condition factors and the outcome variables cannot be done without it since

- employees are an important source for recording specific aspects of working conditions (employees as experts in their activity): For instance, some working condition factors – such as emotional labour – are largely left out from recording e. g. by observation procedures, so that, here, the assessment by the employees represents an important form of methodical gateway, for instance for the determination of emotion regulation strategies;
- events which occur rarely but which are relevant for the execution of the activity can be better determined by means of an interviewing than an observation instrument;
- the sample sizes required for achieving a sufficient statistical power often do not allow for a separate recording of working conditions, e. g. by external experts, for reasons of research economics.

Predominance of cross-sectional studies

The majority of studies are based on cross-sectional studies. Data collected in longitudinal studies are rare, while interventional studies can hardly be found at all. Thus, most of the extracted associations cannot be causally interpreted. However, in various studies on the same working condition factor, correlative associations to the outcome variables which are similar with respect to direction and amount occur. Additionally, several studies verify that the working condition factors have a stronger effect on the health-related variables than the contrary, the outcome variables have on the working condition factors; this supports the expected causal effective direction (the work requirements affect the health). Additionally, it has been shown in various scoping reviews that the results of longitudinal studies and cross-sectional studies converge.

Consistent associations with health-related outcome variables, confirmation of stress factors and resources

An overview of the findings regarding all working condition factors predominantly shows consistent associations with the health-related outcome variables supporting the classification of work requirements as stress factors and resources: Thus, stronger manifestations of a stress factor are mainly associated with mental health impairments (for instance a high value for depression or burn-out). Strong manifestations of a factor which typically has a resource effect (for instance latitude for initiative) are mainly accompanied by favourable manifestations of mental health attributes (for instance low levels of stress, high values with respect to well-being and health). If stress factors and resources are examined together, the results show that, to a limited extent, resources are capable of reducing the unfavourable effects of stress factors on mental health (e. g. detachment). Altogether, the working condition factors show a broad association, i.e. to various well-being indicators - for instance the perception of stress, job satisfaction etc.

Small to medium effect sizes on average

The average strength of the discovered associations is to be evaluated as small to medium in many cases. However, it is to be taken into consideration here that several small effects can indeed lead to a strong accumulated effect of the working condition factors on mental health. Additionally, the effect sizes generally reach a level which to a large extent corresponds to the one of occupational psychological studies (Bosco et al., 2015) and is probably not atypical for outcomes impacted by multiple factors: For instance, the findings reported in the reviews also show that the observed health-related outcome variables generally correlate with various working condition factors.

The design-related statements contained in the studies mainly correspond to the category of “design information” and are thus not empirically derived from the examination results. They generally only present known design knowledge or derive the design recommendations from the study results. There is a deficit in studies which provide information on design know-how tested in the workplace.

Lack of know-how
tested in the workplace

3.2 General design principles and activity-specific design

The objectives of the project “Mental health in the working world – Determining the current state of scientific evidence” are the identification of options for action based on the achieved scientific findings and - if possible - the derivation of general design principles. In order to be able to prioritise the working condition factors examined in the project, here, the scientific evidence and the resulting relevance of the working conditions are to be observed. Generally, the state of scientific knowledge shows that a large number of findings with reference to mental health exists. Individual factors are characterised by consistent associations with mental health, mostly in the form of smaller to medium effects so that general conclusions and design statements are indeed possible. Additionally, certain factors are not only effective in an isolated context: For instance, an appropriate latitude for initiative may also have a favourable effect on other factors. These type of factors are therefore to be given special consideration for the design.

3.2.1 General design approaches: Key factors

The findings on the cause-effect relationships of the working condition factors confirm that characteristics from the “working task” are of central importance for the design of a healthy work environment. Here, as expected, the latitude for activity at work with its components of latitude for initiative and decision-making, assignment variability and complete working tasks takes up a key function in the sense of a resource. It is related to fewer health impairments and/or is connected to favourable health outcomes (well-being, motivation, etc.). Based on the evidence, a double function as a resource can be shown for the latitude for activity at work since, on the one hand, it can have a direct positive effect on mental health but, on the other hand, can also indirectly mitigate or shape stress factors.

Latitude for activity at work

Another key factor is the work intensity, in particular the quantitative requirements for which small to medium effects on burn-out, in particular on its features of exhaustion/tiredness and depersonalisation, become visible. High quantitative requirements are also associated with other mental health impairments, e. g. depression and anxiety, and thus altogether represent a stress factor.

Work intensity

Emotional labour is becoming increasingly significant for mental health against the background of increasing interactional work and is thus another key factor. Emotional labour is a part of various activities and thus relevant to a great proportion of employees, in particular in the service sector since, here, the interaction with customers often represents a constitutional feature of the activity. Both the discrepancy between the expected and the perceived emotional expression as well as the superficial actions are connected with small to medium effects,

Emotional labour

particularly on burn-out, job satisfaction and well-being. Here, among others, interventions should aim at providing employees with an opportunity to withdraw from particularly difficult situations. Additionally, the training of competencies can be helpful for handling strong, negative emotions.

Leadership

In the subject area of “Leadership and organisation”, leadership was identified as another central key factor in the design of work that is relevant to health. It becomes apparent that destructive leadership is to be regarded a stress factor. On the other hand, based on the study results, task- and relations-oriented leadership has proven to be a preventive resource, which is particularly significant with respect to the uncertainty regarding objectives and roles and the corresponding uncertainty regarding regulations, which characterise today’s working environment, since the managerial staff has a central mediation and clarification role at the interface between the individual working tasks and the organisation. In the framework of the project, leadership does not only refer to the dyadic relationship between employees and direct superiors on an operational level in the organisation: working tasks and central characteristics of the work organisation are primarily mediated via the leadership behaviour on the various levels of the organisation, e.g. through strategic specifications, structures, rules, procedure instructions, cultural circumstances, norms and values. Against the background of the increased occurrence of restructuring activities, the handling of phases of job insecurity is of particular significance here. In this respect, managerial staff on all hierarchy levels have a central role in the prevention of (mental) health impairments in the complex and dynamic working world. The qualification and support of operational managerial staff is to be developed further just like strategic and organisational approaches, while it is to be taken into consideration that the managers are to be provided with sufficient latitude for initiative as well.

Working time

Key elements in the subject area of “working time” are the duration, time of day and distribution of working time. They determine the period of time during which employees are exposed to workloads while they can act a stress factors themselves. Small to medium associations exist with mental health problems and performance in the expected direction, i.e. increased duration, unfavourable time of day and distribution (e.g. work at socially valuable hours) have an negative effect on mental health.

In contrast, predictability and options for planning of working time are central elements when it comes to designing working time in a manner that it is beneficial to health (in the sense of resources). They have small to medium favourable effects on the well-being and perception of stress if the employees themselves are able to influence their working time.

The state of findings allows the formulation of critical manifestations with respect to shift work, long working hours and lack of rest breaks. Similarly, on-call duty/stand-by duty should be limited as far as possible.

Here, the possibility of recovery represents a central criterion concerning working time. The dynamic of load and/or stress and the subsequent recovery is a core subject in the analyses of interdependencies in the subject area of “working time”. Here, the concept of detachment, which shows small to medium effects for almost all health aspects, has an important function. The ability to detach from work does not only depend on the working time and the rest period but also from the working conditions: For instance, in the case of high work intensity, unfinished tasks may lead to so-called rumination, i.e. the continued thinking about the task.

Both the design of concrete characteristics of working time (e. g. shift work, long working hours) as well as the design of the interface between work and private life (e. g. availability) as well as the compatibility of the working time with other areas of life (work-life balance) are significant to mental health. Due to increased risks for accidents and errors as well as the indicated effects on mental health, there must be clear, binding and concretely implemented rules for certain aspects of the working time design, such as the amount of the daily and weekly maximum working hours and recovery times both during (rest breaks) and outside of the working time (rest period). Recommendations for other factors of working time can be derived based on the empirically available findings: For instance, individual load limits and individual requirements (among others determined by the life phases and the desire for a good work-life balance) should be taken into consideration - if possible - in the agreements concerning the volume and the time of the day of the working time. In addition, measuring rest periods should not only consider working time proper, but also the time spent on work-related activities, e. g. due to commuting or business trips. There should be clear operational and/or individual regulations which include the interests of the company and the employees for work-related permanent availability.

3.2.2 Activity-oriented design

The design of the working conditions of employees is always an operational, practical challenge as well. It is significantly influenced by the concrete working task and its implementation conditions. Here, the formulation of general design principles can represent a form of first access point for the concrete operational context; however, these principles are activity-specific and need to be further specified and/or supplemented taking into consideration the respective operational framework conditions.

In order to simplify the derivation of design statements, the activity typology approach seems reasonable; such typology describes the activities based on the predominant character of the task and/or the typical load constellations. This shall aim at grouping similar activities based on the dominant key characteristics and at describing characteristic load constellations (e. g. for leadership activity, knowledge-based work etc.) to derive concrete design statements on this base, taking into consideration industry characteristics.

Activity typology and typical load constellations

3.2.3 Design principles and implementation strategies

A comprehensive, system-related analysis and design of (mentally) healthy work is a great challenge. The business-specific implementation of good design in particular requires suitable processes of participation. At the same time, participatory processes cannot replace the required expert knowledge. Combining expert knowledge and the assessment of employees in the framework of a participative process represents a special challenge, which, at the same time, is an important factor for a successful operational implementation.

System-related analysis and design

In view of the growth in mental, interactive and qualified work, employees increasingly set their own goals. They influence the specific design of their working tasks and roles (Wrzesniewski & Dutton, 2001). This is also known as subjectivisation of work/indirect control (Moldaschl & Voss, 2003). Generally, this can be connected to positive and negative effects

Independent design

on health. If the employees become (co-)designers of their work, this requires a corresponding qualification in order to promote the ability to self-design and avoid potentially negative effects. In particular, self-regulation and social competencies, which also support the proactive design of their own work, are relevant here.

In addition to the preventive work-condition related measures, behaviour-oriented measures should also consider the stress factors and resources and, for instance, convey competencies for the development and use of resources, e. g. of an increased latitude for activity at work.

Differential design

Overall, in this framework, the differential work design offers the option of making the health-promoting potentials of the work assignment individually accessible (Bamberg & Metz, 1998).

Prospective design

The best chances for a health promoting work design are provided by the new design of work systems since these offer a prospective approach in the planning phase. More often, however, companies are confronted with the necessity of a corrective work design.

Primary, secondary and tertiary prevention

The analysis of the subject area from an occupational medical point of view shows that, in addition and/or subsequent to the primary prevention, the application of the secondary and tertiary prevention systems offers great potential for the adequate handling of the health consequences of the mental load in businesses. In this respect, it seems sensible to raise the awareness of companies to mental health to a greater extent than it has previously been the case, in particular for the handling of inter-individual health differences. In the framework of the preventive occupational healthcare, this means that a greater focus is to be placed on the early detection of impairment of mental health – irrespective of the type of its cause. Preventive occupational healthcare is an instrument for addressing the interaction between work and mental health; in this respect, initiative and commitment are required not only from the occupational physician but also from the employees.

In the health-promoting work design, the following aspects should be taken into consideration: with respect to the mental working condition factors, in some cases, a reduction (for instance permanent attention requirements), in most cases, however, an optimization of the work requirements is desirable since – as is the case with the work intensity – both overload and underload conditions are to be avoided to the same extent. In view of the effect of the working condition factors as resources or stress factors, new possibilities for occupational safety arise since the promotion and/or the build-up of work-related resources can mitigate the impact of stress factors, provide latitude for the self-design of one's own work or support the development of personal resources (e. g. belief in one's self-efficacy, problem-solving competencies).

3.3 Summary of the need for research

A look at the results of the literature reviews in the individual scoping reviews shows that research in the context of mental health is comprehensive, but also relatively non-specific. The research requirement takes account of the fact that, on the one hand, there is a lack of studies which are close to practice and which provide insights on effective design measures for mental health and, on the other hand, new research questions arise which are the result of the change in the working world, i.e. the changes in activities, work systems and organisational framework conditions.

Generally, the project aims at identifying such gaps and open research questions which will lead to progress in the findings relevant for the objectives of the project – i.e. the derivation of options for action, primarily for occupational safety and work design. Here, it is to be pointed out that, from the project's point of view, not all unclear or insufficiently answered questions are being transferred into a research agenda.

Load constellations are analysed in detail only in a few studies, while holistic analyses are completely missing. However, here, a general demand for studies on the analysis of numerous load constellations would not be expedient: The identification of typical patterns for the occurrence of the key factors described in section 4.2.1 and the detailed analysis of the various forms of activity types in order to formulate design statements for activity classes based on this seem to be more promising.

Load constellations

Particularly against the background of the ever changing working world, it is to be expected that, due to the permanent adaptation and corrective steering processes in organisations, it is more difficult to answer the question of what factors are more effective. This means that there is a need for longitudinal studies which analyse the relevant working conditions and load constellations at several measuring points and over a longer period of time to be able to adequately record changes and temporally cumulative effects.

In this respect, the research requirement in the individual subject areas is as follows:

In the “working task” subject area, substantial associations with various indicators of mental health are reported for the working condition factor of work intensity. Here, studies should analyse the time-related sequence with respect to the duration of the mental load and the influence and design options in order to make more specific statements on the cause-effect relationships regarding mental health. Latitude for activity at work and a holistic task design as well as social support primarily take effect as resources. An examination of the interaction of these factors with other working condition factors presents a desirable but complex research desideratum, in which potential, non-linear effects are to be taken into consideration.

Course of time

Interaction of stress factors and resources

In the past, the occupational-scientific research on working time was based on a strict separation between gainful employment and non-gainful employment, with very few exceptions. It is currently becoming more and more obvious that the analysis of the dynamics of working time and rest periods should increasingly focus on the point of intersection between the two spheres of work and private life.

Analysis of the dynamics of working time and rest periods

Longitudinal studies

The recovery and/or mental (and physical) regeneration after work load plays a central role when it comes to maintaining mental health. Research should focus more on the dynamics of load and recovery. In this respect, studies of the development over time or diary studies are useful. On the one hand, they should examine the effect dynamics of recovery processes, i.e. on the daily and weekly level. On the other hand, they should also examine long-term developments and dynamics to investigate cumulative and compensatory effects of working time requirements and resources over a longer period of time.

Working conditions of managerial staff, leadership behaviour

For the subject area of “leadership and organisation”, leadership has been identified as key factor. Due to the various interrelations with other working condition factors, more findings on the working conditions of managerial staff – particularly in their leadership behaviour in business environments with a high degree of change – should be obtained, e.g. on the basis of qualitative studies analysing not only the specific interaction patterns between managerial staff and employees but also the underlying (more or less supportive) organisational structures and concepts. Additionally, the work situation of the managerial staff themselves as well as their latitude for initiative should be observed more closely.

Extra-aural noise effects, non-visual effects of light

With respect to the technical factors, a research requirement exists in particular with respect to the qualitative manifestations of the physical factors of noise and lighting: Questions regarding the extra-aural noise effect and qualitative characteristics of noise as well as specific non-visual effects of light have only been dealt with marginally for instance. For the health-promoting design of workplaces, a clarification of the association between subjectively perceived noise exposure and physical measurement parameters is also significant.

Interface and interaction concepts

For the human-technology interaction, against the background of the digitalisation of the working world, the question arises how interface and interaction concepts will further develop in view of modern technologies. In this context, it is to be examined which activities are suitable for the use of modern technologies and how the transfer of disqualifying residual work to human beings can be avoided. The technology-centred perspective and the orientation towards technological aspects of the human-machine system, which is also reflected in the Industry 4.0 approach, should be considered in more holistic manner. These emphasise the interaction between humans and machines in a work system and contribute to the development of integrated concepts of human-technology interaction, where questions of the position and perception of decisions and responsibilities are to be increasingly taken into consideration.

Attributable risks

Even though the prevalence of mental disorders is overall stable, from an occupational-medical perspective, there is a need for clarification regarding the attributable risk, i.e. the question of to what extent working conditions contribute to mental disorders and illnesses. There is a need for high-quality longitudinal studies as a precondition for interventions aiming at mental health prevention, both in the narrow as well as in the broader sense (i.e. of physical illness). Additionally, it is to be examined which professional groups are particularly at risk.

Evaluation of offers for primary, secondary and tertiary prevention

Further approaches to occupational-medical actions are provided by the evaluation of options for primary, secondary and tertiary prevention. In particular, qualitative research could contribute to an improved understanding of the cooperation between the various prevention actors (occupational medicine, occupational safety experts, operating engineers, occupational psychologists) and transfer it into examples of good practice.

In the area of comprehensive design approaches, the implementation and evaluation research plays a decisive role: Here, the challenge is to find out in measures-accompanying studies, e.g. industry-wide and company-internal regulations or company-internal interventions, whether and under which conditions (intervention levels, antecedents) these are effective and sustainable or fail in some cases in order to derive further options for activity based on these findings. Lastly, a greater focus is to be placed on examinations on design processes, in particular with respect to the role of the actors involved. For this reason, operational intervention projects are of a greater importance in the context of research, whereby access close to operation should be realised through a closer interaction of research and operational practice.

Implementation and evaluation research

4 Overview from a practical perspective

4.1 Relevance of mental load as an issue of workplace practice

Despite their great distribution (BAuA-Stressreport 2012: Lohmann-Haislah, 2012), their manifold effects on the health of employees (BAuA, 2017; Rau, 2015; Rau & Buyken, 2015; Paridon, 2016) and their operational consequential costs (EU-OSHA, 2014), forms of mental load are only insufficiently dealt with by occupational safety (Langenhan, Leka & Jain, 2013; Eurofound & EU-OSHA, 2014; Lenhardt & Beck, 2016). For instance, according to their own statements, only 22% of all companies have a statutory prescribed risk assessment in which mental load factors are taken into consideration. Such a risk assessment does not exist in a major part (approximately 30%) of large companies with 250 employees or more (calculation according to: NAK-Geschäftsstelle [national occupational health and safety conference], 2016).

In view of this deficit, the project “Mental health in the working world” by BAuA also aims at formulating action recommendations which address relevant problems on an operational level and can be connected to the business structures. To get some indications as to under which conditions and in which forms mental loads are perceived as operational problem by the actors involved and, if applicable, made an object of their operational actions, an explorative study supplementing the BAuA project has been conducted (cf. Lenhardt, 2017). The results represented below are based on the qualitative survey of external prevention consultants of companies who service approximately 220 companies at the time of the survey (additional information on the method can be found in chapter 1.4.2 of the present report).

Qualitative surveys of external prevention consultants

4.1.1 Scope and manifestations of the problem of mental load from the point of view of the experts interviewed

The interviewed prevention experts listed a broad spectrum of mental load factors from their business support practice which correspond to the “working condition factors” examined in the framework of the BAuA project (chapter 1.3.1 of the present report). In the interview material the following focus points become visible in this regard:

- In this context, the intensification of work/pressure is listed most frequently, often in connection with indications to corporate restructuring, cost reduction measures and reduced numbers of employees.
- Additionally, reports of disruptions and frictions in the execution of tasks are relatively frequent; these are mainly regarded as a manifestation of poorly designed workplaces and insufficiently organised workflows.

Intensification of work, defective mechanisms, social relationships

- As a central area of mental load, deficits in the quality of social relationships at work were often in the focal point, namely on three levels: leadership (e.g. lack of communication, support and appreciation in dealing with employees), the cooperation with employees (e.g. conflicts in teams) and the direct interaction with customers/clients (e.g. confrontation with verbal and physical aggression).

Load factors arise in combination

An important discovery from the review of the scientific findings implemented in phases I and II of the BAuA project is the fact that for the assessment of the health effects of mental load, the load constellations must be considered in addition to the individual factors. Similarly, the descriptions of work situations of some study participants make clear that the analytically differentiable, individual working condition factors in the workplace context mostly occur in load configurations and are thus interdependent and intensify one another. One example in this respect is the one of a municipal social security office whose employees have to manage a high (and generally increasing) workload due to chronic understaffing, deal with unfavourable technical, spatial and organisational framework conditions and, additionally, are confronted with a clientele in existential emergency situations, who are therefore partially also “difficult” to handle on a personal level, on a daily basis. In this context, another interview partner mentioned the work in some call centres, which is characterised by the mix of high quantitative performance standards, strict processing schemes, strict controls of the fulfilment of performance requirements, often relatively insecure employment status and high requirements with respect to emotional control.

Multiple effects on health and well-being

Naturally, the interview partners could not make any verified statements regarding the health effects of such and similar load experiences with the employees of their corporate customers (in the sense of the allocation of causes). However, many reported unfavourable after-effects whose association to the work conditions they believed to be very plausible. Here, phenomena such as exhaustion, demotivation, disappointment, anger, retreat, anxiety and guilty conscience were central, i.e. manifold impairments of well-being at the forefront of manifest illnesses.

4.1.2 Options and obstacles for addressing the issue of mental load in the workplace

“Mental health” often not discussed in the workplace

Despite the generally growing public attention for the subject area of mental health and work, according to the interviewed prevention consultants, the subject does so far not play an important role in most companies. If, in these companies, mental issues are addressed, this is mostly done in the context of mental disorders and illnesses but not in the work-related mental load.

Misunderstanding of the problem, fear of “excessive” demands

Additionally, a rigorous rejection of the subject area by company-internal decision makers has also been reported in the interviews. The participants in the study believed that one reason for this was the reported misunderstanding that this was about mental illnesses, for which the responsible persons in the company did not wish to assume responsibility since this was a particularly sensitive subject and its relation to the working conditions was not absolutely

clear. It was further assumed that any form of rejection from the management is the result of their fears that, in the event of the revelation of operational design deficits, their image might suffer and that they would possibly be confronted with “exaggerated” claims and requests.

However, various company circumstances and events seem to have the effect that the subject area of “psyche” (not necessarily the “mental load”) is put on the corporate agenda in one form or another. As starting points and causes of the thematisation, the study participants mentioned the following, among others:

- The occurrence of severe cases of individual health crises in the company (frequently used key word: “burn-out”),
- Occupational integration management procedures in which aspects of mental impairment and mental loads in the workplace play an important role,
- the number of cases of incapacity to work which take an unfavourable course,
- pressure by the employees’ representation to tackle the issue of mental loads (for instance in the framework of risk assessment),
- the expectation that the supervision calls for a consideration of mental load in the risk assessment,
- participation of managerial staff or members of the work council in the relevant specialist events and training seminars as well as consultation meetings,
- previous experience with established management processes as well as personal and organisational development practices, which can be followed by the processing of the subject area of “mental load”.

Opportunities to address the issue of mental health

However, so far, these explorations of the topic do not often lead to a systematic management of working conditions leading to mental loads in businesses. Instead, in some cases, the interview partners reported various types of “substitutional actions” (implementation of an employee survey “to be filed away, organisation of “health days”, sending impaired performers to “wellness” treatments etc.), which, however, are presumed to be more of an expression of the companies’ deep-rooted insecurity regarding the handling of the subject area rather than a diversionary tactic.

Systematic approaches are rare

This insecurity is also noticeable in companies which explicitly face the task of a systematic stocktaking and evaluation of the mental load (risk assessment). Especially in the initial phase of such processes, according to the study participants’ experience, uncertainties, misunderstandings and differences of opinion occur frequently. Whether or not the required clarification, communication and compromise-building processes are successful depends heavily on how well the prevention experts instruct the companies and are able to support them in the process. Here, the capability of demonstrating to the companies the necessity of addressing the problems of mental load for their operations and finding relevant, company-internal allies plays an important role.

Great uncertainty regarding the handling of mental loads in the workplace

Role of prevention consultants in the initiations of a risk assessment

High degree of methodical pragmatism on behalf of businesses

Some interviewees also reported the use of empirically validated measurement instruments for recording and classifying mental load. Nonetheless, most companies obviously maintain a profound methodological pragmatism in regard to risk assessment, which is mainly based on the need for a data collection and analysis procedure which fits the company and can be managed by it. This does not mean, that professional soundness is not important when it comes to selecting the procedure. However, in this context, the implementation possibilities and the practical requirements of the company at least play a similar role as decision criteria. In any case, there seems to be a broad awareness of the fact that, even with data collected with scientifically tested instruments does not necessarily “speak for itself” but requires a discursive, interpretive processing by the operational actors. At least in bigger companies, a combination of oriented and/or screening procedures and specifying, participative analysis and problem-solution procedures (moderated workshops) can be relatively frequently found in practice (cf. in this respect: BAuA, 2014). In smaller companies, on the other hand – provided that they are open to this subject at all – the interviewed prevention consultants see the individual or group discussion as the generally only sensible and practicable approach.

Interpretive processing of collected data in discourse in the workplace

Difficulties in the process of the risk assessment of mental load

The interview material also shows that the process which is started with the initiation of a risk assessment does not necessarily always gain the dynamics and depth necessary for achieving substantial practical progress on the area of mental load. For instance, it is reported that the actors involved sometimes mutually block each other, get stuck and entangled in insignificant matters already in the preparation and planning stage. Furthermore, company-internal restructuring, staff changes or the mere “submersion into day-to-day business” sometimes have the effect that the project of implementing a risk assessment for mental load comes to a stop or is abandoned altogether. From the interview partners’ point of view, critical cases occur if the risk assessment is primarily seen as formal fulfilment of duties, if it turns out to be mainly a task for experts and decision makers without the broader involvement and participation of the employees or if the collected data and information do not lead to any significant consequences (the above-mentioned “survey to be filed away”).

4.1.3 Interventions and organisational action by businesses

Design takes place in many different areas of activity in the workplace

In consideration of the statement above, the question arises to what extent companies address the identified load problems in the sense of protection and design measures referring to it. In this context – some interview partners highlight this themselves – it is to be taken into consideration that the design of work conditions, processes and relationships and thus the impact on mental load situations take place in multiple different corporate arenas– in performance and working time policies as well as in staff planning, in qualification or in quality management. On the one hand, this highlights the fact that dealing with the conditions and manifestations of mental load means dealing with “completely normal”, recurring operational phenomena and issues which managerial staff and employees are confronted with and handle on a daily basis. On the other hand, this also refers to a real diversity of problem knowledge as well as the implicit and/or informal design knowledge and actions in the companies, which represents an enormous internal potential for change. In this respect, a few examples were mentioned in the interviews, for instance the customer service of a private specialist clinic, where employees organised a task rotation between inbound and outbound activities with the corresponding - mentally favourable - changes in requirements in a mostly independ-

Wide variety of implicit and informal design knowledge and design activities in the workplace

ent manner. Another example is an early warning system for the winter service, technically realized by a web cam, which reduces the early morning turn out for pure probing purposes in a municipal building yard.

In addition to these exemplary cases of an informal, preventive design practice in the interview material, numerous other measures, which have been taken based on a targeted preoccupation (in particular in the framework of risk assessment) with mental load and its consequences, are indicated. These include

Measures and offers of support

- individual or group-related training and support offers (from stress management course via communication training for managers up to team and supervisor coaching and conflict moderations),
- technical/organisational measures for improving area-internal and cross-area information and communication flows, for reducing work interferences and time-pressure situations as well as for avoiding traumatizing events (e. g. Introduction of regular department meetings, optimisation of requirement message systems, introduction of mandatory shift transfer talks as additional paid working time, “door closing regulations”, spatial expansions, installation of alarm buttons for emergency situations), and, finally (although these are rarer since they are harder to implement),
- personnel and working time related measures (increase in staff for eliminating the most severe bottlenecks, a more favourable shift schedule design to reduce load, more lenient break rules).

Altogether, a more significant emphasis is placed on “smaller solutions” in the intervention and design practice of companies. The interviewed prevention partners, however, do not generally regard this as an expression of an action deficit on the part of companies, especially since the mentioned “small solutions” often lead to noticeable improvements in the work situation according to their assessment, without referring back to established occupational-scientific design standards to a significant extent.

Frequent focus on small-scale solutions

Nevertheless, the derivation and the implementation of measures in companies are subject to various restricting influences, which, often (at least temporarily) have the effect that the real implementation steps stay behind of what is actually necessary and generally indeed possible:

Obstacles to implementation

- In some cases, the corporate organisation culture is shaped by unwritten social rules of behaviour which make a systematic inclusion of the employees in the prevention of mental loads – and thus a broad mobilisation of the corresponding existing company-internal design knowledge – significantly harder.
- Often, occupational safety is mostly decoupled from other areas of activity of the company which are relevant to the issue of mental load (see above) both structurally and procedurally, so that problem indications or design impulses from these areas can hardly be absorbed by it.

- Apparently, certain suggestions for measures which are generally applicable and integrated into the corporate discussion are often skipped for economic reasons. In particular, this is the case if they deal with staff capacities and working time questions but also with respect to construction-technical conditions.
- Many companies are lacking criteria for the assessment of the need for intervention. Often, companies do not know which limits or values must be given to initiate a design measure. This is also true for measures which are mandatory by regulation, in particular in the area of mental load. Here, without doubt, the bodies responsible for occupational safety are required to set out more specific orientation standards and to provide the companies with such standards. Even if this was done, however, the definition of “intervention thresholds” would always be the result of variable interpretation, negotiation and compromise-building processes of businesses – as can be seen in some interviews .

4.1.4 Summary and conclusions

The high quantitative significance of mental loads in the working world, which has been determined in numerous survey studies was confirmed in the present examination from a practical point of view. The spectrum of the working condition factors identified as load-relevant by the BAuA project is reflected in the reported observations of the interviewed prevention consultants to a high degree.

The descriptions of the study participants also show various problems which can be incurred by companies due to working conditions which are designed in an unfavourable way with respect to mental health, such as a high rate of absence due to inability to work, problems with the reintegration of employees returning after such absence, qualified employees going to their limits, a deteriorating work atmosphere or (impending) conflicts with the employment representation and/or the respective supervisory bodies. If applicable, such problems justify a direct interest for businesses to address the subject and, under certain circumstances, e. g. the presence of a competent and motivated promoter in the business, can lead linkable management concepts to an entry point to further activities in this area. As some of the examples mentioned in the interviews show, companies can rely on versatile knowledge of the problems of their employees and a corresponding “local” design knowledge for the definition and implementation of these activities.

Confrontation with the issue in the workplace is still in its initial stages

Nevertheless, the systematic examination of this subject is still a relatively new thing in the companies. On the one hand, this is connected with the common information deficits and misleading interpretations with respect to the subject of “mental load”. As the interviews show, their connotation with “mental illness/disorder” often prevents corporate actors from tackling the subject matter in a resolute manner. If the prevention consultants of the companies are successful in putting the focus on the examination of working conditions and work situations in this context, their (potential) risk character might often be in the foreground; however, some examples mentioned in the interviews show that this can also lead to an increased concentration on an operational design area which also includes organisational and social resources. However, as mentioned above, this subject is not brought that far in most companies.

The fact that, on an operational level and in particular with respect to the mental load, it is apparently particularly difficult to identify the design requirements and implement these in adequate measures. This problem is not only related to the novelty (or foreignness) of the subject for the companies. In this context, the fact that with picking up the subject, aspects of the corporate interest structure and the respective corporate culture are involved which might interfere with the formation of a shared understanding of the problem and, under certain circumstances, heavily impede changes, is at least similarly decisive (cf. Marstedt & Mergner, 1995; Kratzer & Dunkel, 2011; Beck, 2013; Helbo Jespersen et al., 2016).

Wide variety of obstacles to thematisation and implementation

In view of the significance of mental load in the working world, which has been verified in numerous scientific studies (and confirmed by the observations of the interviewed operational prevention consultants), it seems appropriate that these will be increasingly addressed by the occupational safety policies, for instance in the framework of a multi-annual priority programme of the *Gemeinsame Deutsche Arbeitsschutzstrategie (GDA)* [joint German occupational safety strategy]. Here, important improvements have already been initiated, such as the stipulation of binding criteria for the statutory supervision and consultation activities in this area, the consent regarding the recommendations for the implementation of the risk assessment for mental load, the development and implementation of detailed qualification concepts which refer to the subject matter of mental load for supervisory staff and company occupational safety experts or broadly designed information and awareness raising campaigns (Splittgerber, 2015). In view of the empirical findings of this study, however, it is to be expected that substantial progress in the prevention and design practice referring to mental load will not be an “instant effect” of a newly adjusted and better instrumented occupational safety policy but will rather be the result of a longer-term, complex and also conflictual learning process – both on the side of the companies as well as on the side of those who try to impact the corporate actions.

Increased addressing of the problem by occupational safety policy

More long-term learning processes required

4.2 Regulatory framework and programme-related activities concerning mental load

4.2.1 Structuring and course of action

The standardised regulation of aspects of mental health and mental risks at work is implemented in a multi-level and multi-actor system. This includes setting rules and agreeing on framework regulations on a supra-national level via the European Union and, in a national context, covers the central legislation such as *Arbeitsschutzgesetz* [German occupational safety act], the directives and technical regulations as well as the standardisation, the provisions and industry regulations in the autonomous ordinance law of the accident insurance companies.

Since a comprehensive and definitive compilation of all regulations dealing with mental load and mental health would go beyond the scope of this report, instead, their systematics as well as the most important laws, directives and rules in this context are summarized here.

As an example, table 16 shows the hierarchical levels of the regulation and selected rules which deal with mental health and/or risks affecting it.

A binding statutory regulation, however, is only a starting point for protecting the employees. Programmes, campaigns and activities of different actors in the area of labour and health policies, which aim at the design of working conditions in concrete businesses as well as at the development of competencies and the activities of corporate actors and occupational safety officers, follow a different approach. Numerous examples for this type of activities exist, for instance the *PSYGA* project, which has been developed in the framework of the *Initiative Neue Qualität der Arbeit (INQA)* [initiative for new quality of work].

The representation below neither claims to completely present the regulatory framework nor to comprehensively map the numerous programmes, initiatives and offers on the various political and institutional levels. Instead, both forms of access are represented in a synoptic manner and illustrated based on selected examples. Here, the question of which linking potentials for corporate actions for the improvement of mental health at work are offered by generally binding regulations and business and personally oriented programmes, initiatives and offers is of particular interest.

4.2.2 General systematics of regulation

A systematic examination of the regulatory approaches dealing with mental health in the working world shows that, on the various levels of the regulation and in the different content areas, regulatory requirements on a generally high level of abstraction are given. Here, it is characteristic that the necessity for taking into consideration mentally relevant factors is indicated on the upper levels while concrete design requirements are mentioned on a subordinate hierarchy level. Within this regulation hierarchy, the degree of the binding character reduces in a downwards direction. For instance, the technical regulations are not binding but trigger the “presumption of conformity”. This means that the fulfilment of the criteria of state mandated regulations is generally connected to the fulfilment of statutory requirements. The

presumption of conformity is also instituted by harmonised European standards, for instance by those on the additional specification of the machinery directive (regulation 2006/42/EC). These standards also include those on the ergonomic design of machines, in which cognitive, mental design aspects are taken into consideration as well.

Here, the authority to establish rules and regulatory actions does not necessarily result from the explicit mentioning of mental aspects in the regulations but, also implicitly, for instance through the general clauses e. g. In the European Framework Directive on occupational safety (89/391 EEC); in article 5 thereof, employers are obliged to ensure the safety and the protection of health of employees with respect to all aspects affecting work, which also includes psychosocial factors.

Table 16 Hierarchic levels of regulation and selected rules relating to mental health.

Level of regulation/standards	Set of rules	Example
European Framework Directive	European Framework Directive on occupational safety (89/391/EEC), Article 5	“The employer shall have a duty to ensure the safety and health of workers in every aspect related to the work. ”
National law	Occupational Health and Safety Act	“The work must be designed in such a way that any hazard for life, as well as for physical and mental health , is avoided as far as possible and the remaining risk is kept as low as possible; ...“
National ordinance	New BetrSichV (2015)	“In particular, they (the employer) shall ensure that all factors associated with the health and safety of the employee, including mental health , are sufficiently considered in the design of work organisation, work method and the workplace, as well as in the selection and provision of the technical aids.”
Technical Rule	TRBS 1151	“This Technical Rule is applicable for the assessment of hazards and load, as well as the determination of measures for the protection against hazards when using technical aids ... due to physical and mental loads leading to negative consequences of strain for the employees.”
European Directive	Machinery Directive 2006/42/EC Annex I	“... psychological stress faced by the operator must be reduced to the minimum possible ...”
Standardisation	DIN EN ISO 6385: Ergonomics principles	“When designing work equipment psychological aspects shall be considered in addition to physical and/or mechanical factors.”

4.2.3 Selected national statutory and regulatory provisions in the context of mental health in the working world

4.2.3.1 Relevant statutory and regulatory provisions

In the national context, the consideration of the mental load at work is bindingly prescribed by a series of laws and occupational safety directives, e. g. *Arbeitsschutzgesetz*, *Arbeitsstättenverordnung* [German workplace ordinance], or *Betriebsicherheitsverordnung* [German ordinance on industrial health and safety at the workplace] or is the implicit result of the protection targets of the law, as is the case with *Arbeitszeitgesetz* [German act on working time]. Relevant legal and statutory provisions can also be found in laws and regulations in which the structure of the occupational safety system, the responsibilities, tasks and competencies of the individual actors as well as their cooperation are addressed, for instance in *Arbeitssicherheitsgesetz* [German law on occupational safety] or *DGUV* [German Social Accident Insurance] regulation 2.

Besides the laws from the stricter occupational safety context, aspects of mental health of employees are also addressed in the statutory bases for occupational prevention (*SGB V, Präventionsgesetz* [German prevention law]), on the occupational reintegration management (*SGB IX*) and the rules on occupational healthcare [*Verordnung zur Arbeitsmedizinischen Vorsorge (ArbMedVV)*].

Finally, with the consented guidelines and recommendations of *Gemeinsame Deutsche Arbeitsschutzstrategie* [Joint German Occupational Safety Strategy] on the subject of mental health, regulations which have been coordinated between the most important occupational safety actors exist which contribute to an equal counselling and supervision of the supervisory services and, however, are also elements of the company-oriented activities of the *GDA* programme on mental issues.

4.2.3.2 Working Conditions Act

The *Arbeitsschutzgesetz (ArbSchG)* [Working Conditions Act], which entered into force in 1996, and the obligations of the employer defined therein are of particular importance for the protection of mental health. According to Section 4 *ArbSchG*, work must be designed in such a way that any hazard for life, as well as or physical and mental health, is avoided as far as possible and the remaining risk is kept as low as possible. This requirement is further specified in Section 5 *ArbSchG*, in which the obligatory implementation of a risk assessment is prescribed and the mental load at work is named as potential risk. The clarification that the definition of health on which the *Arbeitsschutzgesetz* is based includes both physical and mental health, that health risks may also occur due to mental load and that these are to be taken into consideration when implementing risk assessments was published in 2013. This was preceded by an intense specialised policy debate which concentrated on the pros and cons of a separate directive for the protection against risks due to mental load at work and in the course of which, in May 2013, a corresponding draft directive was introduced to the political discussion by a majority of the federal states in the *Bundesrat* [Federal Council]. In the further course, in November 2013, in the coalition agreement between CDU and SPD for the legislative period of the 18th *Deutsche Bundestag*, it has been agreed that additional clarifications for the protection of mental health are to be implemented in occupational safety regulations and that a determination of the current state of scientific evidence, which provides both a profound overview of mental load factors in the working world as well as options for action for the necessary regulations, is to be realised.

4.2.3.3 Working Hours Act

The working time law and the underlying protection targets form a central element of the regulatory framework on the subject of mental health in the working world, even though these are not explicitly mentioned in the law. Its scope of regulation covers aspects such as maximum working time, rest periods, shift and night work, work on Sundays or rest breaks. Other aspects, e.g. the permanent availability or mobility, which pose a new challenge to the demarcation between working time and rest period have not been regulated in the legal context so far but increasingly represent a design challenge on the company level due to the factual circumstances produced by new work forms. Generally, the working time law in its current form offers a framework here which can be developed by the case law and the negotiation processes of the collective bargaining agreement.

4.2.3.4 Occupational Safety Act

The law on company physicians, safety engineers and other experts for occupational safety (*Arbeits-sicherheitsgesetz* [Occupational Safety Act], *ASiG*) regulates the responsibilities, tasks, competencies and cooperation obligations of the three professions mentioned in its title. In Section 3, the *ASiG* stipulates the tasks of the company physicians. Among others, they are required to advise the employer in occupational psychology matters, assess the working conditions, examine the causes of work-related illnesses, record and evaluate the examination results and propose measures for the prevention of such illnesses to the employer and instruct all employees in the company with respect to health risks to which they are exposed during work as well as measures and equipment for the prevention of such risks. In this context, the general occupational health examinations according to Section 3 *ASiG*, which can serve as primary prevention approach for the recognition of individual psychological strains and the consequences of their possible illnesses, are of particular importance.

The tasks of the experts for occupational safety are indicated in Section 6 of the *ASiG*. This includes the consultation of the employers indicated in Section 6, 1 with respect to the design of workplaces, the workflow and the work environment as well as the general assessment of the working conditions, which in turn includes factors affecting mental health.

Against the background of the increasing significance of mental load, the numerous factors which play a role here as well as the complexity resulting from their interactions, the question remains if and to what extent other professions than the one discussed in the *ASiG*, e.g. occupational psychologists, shall be assigned tasks in this context.

4.2.3.5 DGUV Regulation “Company physicians and occupational safety specialists”

In a broader perspective on the legal system of occupational safety, the mention of mental load in the autonomous law of the accident insurance companies, more specifically in the accident prevention regulation “*Betriebsärzte und Fachkräfte für Arbeitssicherheit*” [company physicians and experts for occupational safety] (DGUV regulation 2) is to be mentioned at this point. For instance, in the part on general care, experts for occupational safety and company physicians are prompted to check elements of the work system with respect to occupational psychology matter as well. Additionally, they have the task of supporting the employer within the framework of company-specific care in the design of company programmes, strategies and campaigns on handling mental load issues.

Ordinance on Industrial Health and Safety and Workplace Ordinance

4.2.3.6 Ordinances

Betriebsicherheitsverordnung (BetrSichV) [German ordinance on industrial health and safety] and *Arbeitsstättenverordnung (ArbStättV)* [German workplaces ordinance] are the two central ordinances with respect to the technical factors of the subject of mental load. Here, the *Betriebsicherheitsverordnung* emphasises the general necessity of the consideration of mental load in the use of technical aids (Section 3, Para.2, *BetrSichV*) and thus also includes the subjects of human-machine and human-computer interaction, which are particularly important against the background of the changes in the workplace. *Arbeitsstättenverordnung* deals with the mental load in several points, mainly in Section 3a, which refers to the consideration of physical and mental load in the risk assessment, as well as in the annex “*Anforderungen und Maßnahmen für Arbeitsstätten nach § 3 Absatz 1*” [requirements and measures for workplaces as per Section 3, para. 1], in which, among others, the requirements regarding the environmental factors of light, noise and climate as well as specific aspects of VDU work are further specified.

Ordinance on Preventive Occupational Healthcare

Additionally, in the *Verordnung zur Arbeitsmedizinischen Vorsorge (ArbMedVV)* [German ordinance on occupational healthcare], mental health is mentioned explicitly. Occupational healthcare serves the purpose of “assessing the individual interactions of work and physical and mental health and the early detection of work related health disorders as well as determining whether or not an increased health risk exists when carrying a specific activity...” (Section 2, para. 1, no. 2). Occupational healthcare is meant to contribute to the further development of occupational health and safety. It considers individual dispositions which can be used as a basis for deriving individual protective measures. For particularly risky activities, *ArbMedVV* stipulates the mandatory and optional prevention; to all other activities, the individual prevention is applicable. This is also the case if an employee assumes an association between a mental load at the workplace and health issues. Over the past few years, the Committee for Occupational Medicine (AfAMed) at the BMAS has been working on the issue of mental health and has described, among other things, in its Occupational Health Recommendation (OHR) “Mental health in the workplace” how company physicians can contribute to maintaining or re-establishing the mental health of employees (BMAS, 2016). The questions of how and to what extent company doctors currently adhere to these recommendations and to what extent mental health is relevant in occupational healthcare in the companies cannot be validly assessed at the moment. The AfAMed has also prepared another OHR on individual prevention (BMAS, 2015).

4.2.3.7 Ordinance Initiative

IG Metall [German Metalworkers' Union] has demanded an ordinance for the protection against risks caused by mental load at work, a so-called “anti-stress ordinance” (*IG Metall Vorstand* [Directorate of the German Metalworkers' Union], 2012), in addition to the existing ordinances for the protection employees against the negative consequences of mental load at work. In this respect, one reason mentioned is a gap in the provisions of the existing laws and regulations which leads to the fact that, despite the increasing share of mental illnesses in health issues, mental loads at the workplace are not considered to a sufficient extent since these play only a small role in the occupational safety actions of the supervisory authorities and holistic risk assessments taking into consideration the mental load are rare. In a binding and concrete regulation which, according to the proposal, could be passed by the German federal government based on Section 18 *ArbSchG* and be further specified by the technical rules, is regarded as the most suitable option of making progress in the indicated points

according to the initiators. As mentioned in the discussion of the *Arbeitsschutzgesetz*, in their 909th session on 3 May 2013, the *Bundesrat* has passed a resolution on an initiative for an “ordinance on the protection against risks posed by mental loads at work” proposed by the federal states Hamburg, Brandenburg, Bremen, North Rhine-Westphalia and Schleswig-Holstein, in which the federal government was asked to ensure a further specification of the general clauses and obligations as can be found in *Arbeitsschutzgesetz* by way of ordinances. In the corresponding response by the federal government, the Federal Ministry of Labour and Social Affairs referred to the stipulations of the coalition agreement in March 2014.

4.2.3.8 Prevention Act

One of the targets of the “*Gesetz zur Stärkung der Gesundheitsförderung und der Prävention*” [law on strengthening the health promotion and prevention], passed in June 2015 and, as composite act, has modified several laws, mainly in the *SGB V* statutory health insurance -, is the prevention of mental illnesses. Generally, the law aims at improving the health promotion and prevention in various areas of life of people and, in particular, at improving the interaction of company health promotion and occupational safety. In order to achieve this, the working-environment related targets and activities of the *Nationale Präventionskonferenz (NPK)* [national prevention conference] as well as the targets and areas of activity of the statutory health insurance in the area of company health promotion shall take into consideration the objectives for the protection and strengthening of health under work-related mental load as determined in the framework of the *Gemeinsame Deutsche Arbeitsschutzstrategie (GDA)*. A direct reference to mental health can be found in Section 20 *SGB V*: Here, the *Spitzenverband Bund der Krankenkassen* [German federal association of statutory health insurance funds] is obliged to consider the health objective of the “prevention, early detection and sustainable treatment of depressive disorders” in the implementation of its tasks. The subject of mental health is also indirectly addressed by Section 20a on services for health promotion and prevention in living environments, in para. (1) of which it is stated that, for the rendering of services for persons whose occupational reintegration is particularly complicated due to health restrictions, the health insurance companies work closely together with *Bundesagentur für Arbeit* [German federal labour office] and the municipal providers of the basic income for job seekers. This general formulation also addresses health restrictions due to mental illnesses and the promotion and/or restoration of mental health. Section 20c, para.(1), sentence 2, *SGB V*, is particularly important for mental health in the working world; it reads: “In particular, they [the health insurance companies] provide measures which are directed at specific work-related health risks for the company-internal health promotion according to Section 20b in concert with the statutory accident insurance companies and inform them about the findings they have gained with respect to the associations between illnesses and working conditions.”

4.2.3.9 Company employee reintegration management

Since 2004, there is a statutory obligation on the implementation of a company employee reintegration management. The concrete provisions in this respect can be found in book nine of the German social insurance code (*SGB IX*), Section 84 (prevention), para. 2. Here, it is stipulated that employers must offer a company employee reintegration management to all employees who are incapacitated for work for longer than six weeks within one year. Here, it is irrelevant on which illness the incapacity for work is based and whether or not the working conditions have contributed to the occurrence of the illness. In the framework of the company employee reintegration management procedure, the employer is required to clarify

Book Nine of the German
Social Insurance Code
(*SGB IX*), § 84 (Prevention)

how the incapacity for work can be overcome, with which services or aids another incapacity for work can be prevented and how the workplace can be maintained. Since the law does not stipulate the manner in which a clarification is to be made, the companies are required to develop suitable individual solutions. Many companies have concluded company agreements in this respect, in which the parties involved in the procedure and the individual steps in which the company reintegration management is to be implemented are bindingly agreed between the company-internal parties. Generally, it can be said that the question of how frequently and structured a company employee reintegration management is offered and implemented heavily depends on the size of the company. While the company employee reintegration management represents an established instrument in large companies, in small and medium-sized companies, information and implementation deficits still exist (Knoche & Sochert, 2013).

With respect to the reintegration and handling of employees with mental problems, who are of particular interest in the context of this report, it can be stated that on the side of the company, there are often still great uncertainties which make an ideal reintegration more difficult. Concepts for the professionalisation of actors (e. g. “return to work coaches”) who are responsible for accompanying employees with mental health problems, coordinating the various parties involved – medical centre, company, pension insurance and social insurance companies –, promoting the self-management of the parties affected as well as the provision of low-threshold information and support for companies offer promising approaches in this respect (Stegmann & Schröder, 2016).

4.2.3.10 Guidelines and recommendations of the Joint German Occupational Safety Strategy

In the German occupational safety system, the prevention of work-related health risks is not exclusively the task of the official health and safety authorities but also of the statutory accident insurance companies. In order (a) to coordinate the work of the official health and safety authorities of the federal states, the accident insurance companies and the federal government, (b) to regulate the existing occupational safety matters in a uniform and transparent manner and (c) to promote the implementation into operational practice, the *Gemeinsame Deutsche Arbeitsschutzstrategie (GDA)* [Joint German Occupational Safety Strategy] was initiated in 2008. In its second work phase from 2013 till 2018, one of the three work programmes of GDA deals with work-related mental loads. The overall goal of the GDA work programme on mental health is the broad implementation of measures for the humane design of work and the prevention of health risks caused by the mental load. In order to achieve this, the information, sensitisation and qualification of the company-internal and company-external actors in occupational health and safety, the identification or development of suitable procedures for assessing the working conditions (in particular the risk assessment), the distribution of examples for good practice and the implementation of operational design solutions were defined as subordinate objectives.

Guideline “Counselling and supervision in cases of mental load in the workplace”

Due to the prominent role of the risk assessment as a central instrument in occupational safety, the increase in the certainty of action of the companies and supervisory personnel in this area is of particular relevance. Necessary conditions in this respect were (a) the further specifications and a consensus regarding the requirements of the companies concerning the considerations of mental load in the risk assessment, (b) an agreement regarding the competencies which are required by the actors in this respect, and (c) how a corresponding counselling and supervision of the companies by GDA providers can be implemented. For instance, the GDA guideline “Counselling and supervision in cases of mental load in the workplace”

in the sense of Section 21, para. 3, no. 1, *ArbSchG*, and Section 20, para. 1, no. 1, *SGB VII*, further specifies the methodical procedure of the state authorities responsible for occupational safety and/or the accident insurance companies for the counselling and supervision of companies and thus ensures a uniform understanding, an equal assessment of operational situations and the intertwining of the counselling and supervision strategies.

The *GDA* publication “Recommendations for the implementation of the risk assessment for mental load” (*Leitung des GDA-Arbeitsprogramms Psyche* [Directorate of the GDA Work Programme on Mental Health], 2016) is aimed at employers, managerial staff, organisational representatives, occupational safety officers and company physicians. The recommendations explain the procedures, methods and instruments for implementing the risk assessment in seven steps and thus describe a corridor for the concrete implementation of the risk assessment.

[Recommendations for implementation of the risk assessment for mental load](#)

The necessity of supporting companies and occupational safety actors by corresponding offers is verified by the results of the *GDA* general evaluation (*NAK* office [office of the national occupational safety conference], 2017) and the *SIFA* long-term study (Trimpop, 2012): Only about half of the companies fulfil their statutory obligations according to *ASiG* and/or *DGUV* regulation 2 in a sufficient manner. The necessary statutory risk assessment is only carried out in half of the companies. In the implemented risk assessments, mental load is considered to very different extents, depending on the size of the company. For instance, in 2015, of all companies with more than 250 employees, 47% carried out a risk assessment in which mental health is considered but which is incomplete in other areas. A further 23% carried out a risk assessment which includes mental load and is complete. Altogether, 70% of the companies with more than 250 employees implement a – more or less complete – risk assessment taking into consideration mental load.

[Results of the GDA General Evaluation and the SIFA Long-term Study](#)

For companies with less than ten employees, 11% carried out a risk assessment which includes mental load but is incomplete. 4% of the companies carried out a risk assessment which considers mental load and is complete altogether. This means that, of all companies with less than ten employees, 15% carried out a – more or less complete – risk assessment including mental load.

At the same time, a large number of safety officers and company physicians admit that they do not possess sufficient knowledge and appropriate competencies in the subject area of mental load and, therefore, they only regard themselves restrictedly suitable to pursue that subject area with the same emphasis as is the case with technical, organisational and occupational-medical subject areas.

For this reason, the *GDA* programme on mental health placed the focus on the individual development of competencies of the most important company actors and, with their “recommendations for the qualification of workplace actors concerning the implementation of the risk assessment for mental load”, published a document in which the desired outcomes of qualification offers are analysed and presented in a differentiated manner, according to target groups. This provides a guideline for the structure, scope and contents of qualification offers of the various providers of further education and training and thus contributes to the convergence of the offers and their quality assurance.

[Recommendations for the qualification of workplace actors concerning the implementation of the risk assessment for mental load](#)

4.2.4 Mental health programmes and activities at the company level

4.2.4.1 Mental load programmes and activities at the company level

The available project results highlight the systemic complexity of the field of mental health and point out that an effective and sustainable prevention of mental load cannot be achieved by regulation and the connected procedures and instruments alone. Similarly important are the capabilities of companies with respect to the management of the specific company- and activity-related mental load and the implementation of suitable measures. In this respect, the company-internal occupational safety officers, the company-internal social partners, managerial staff and the employees themselves are all groups with important roles and functions. The programmes, initiatives and activities on a company level target both the development and advancement of knowledge and competencies for occupational safety officers and their support in the implementation and application of concepts and instruments as well as the establishment and design of processes which enable a professional and operationally suitable handling of mental load.

Programmes, initiatives and approaches which explicitly deal with mental health in the working world are in the centre of the following observations. However, we also examine selected programmes which are broader but suitable of making a significant contribution to mental health in the working world.

A systematisation of the programmes and activities on mental load on a company level can be realised based on three structural characteristics:

- Objectives of the offer
- Target group(s)
- Providers and actors

For the objective dimensions of the programmes, ideally, it can be differentiated between raising awareness and information, development and dissemination of solution approaches, guidance documents and instruments as well as the development of competences in the company's occupational safety officers.

In practice, however, hybrid and multi-dimensional objectives are common. Raising awareness and the dissemination of instruments often go hand in hand, for instance through differentiated offers under "one roof", e.g. in the framework of *GDA* or more comprehensive projects, such as the *INQA* project *PSYGA* or through the integration of objectives in one single, comprehensive guideline or another instrument.

Raising awareness and information

With measures of raising awareness and information, an awareness for the relevance of mental health in the working world as well as its underlying factors and associations is to be created in the companies and among actors and employees. In a second step, possibilities for a further management of the subject are to be shown. Corresponding offers, often follow a firm low-threshold approach: No specific previous knowledge is required here, the media and formats used are easily accessible and usable, while the forms of representation and the language are easily understandable.

The development and dissemination of solution approaches, guidelines or instruments represent another objective category. One special challenge in this respect is developing scientifically sound offers and designing them in a manner that they can be linked to workplace situations, logics of action and practices. In this context, guidelines for the implementation of legally prescribed company obligations – such as the risk assessment – or the recommended procedures and processes, e.g. on health-promoting leadership, play an important role. Additionally, operational best-practice examples and benchmark approaches are frequently used, with which successful implementation examples are presented to the companies “on eye level” and allow for a comparison of their own status and/or development status with other companies.

Development and promotion of solution approaches, guidance documents and instruments

The dissemination of solution approaches and instruments is often also connected to measures for the use of consultations offers. For instance, the use of specific instruments, in particular, however, the implementation of complex participation-oriented organisation development procedures in operational programmes and initiatives, is often accompanied by consultation offers. For their implementation, e.g. in the INQA context, a pool of specially qualified consultants is available. Small to medium-sized companies, which are often confronted with special challenges in the introduction and implementation of measures, may also receive financial support in making use of such consultation offers, via the BMAS support programme “*unternehmenswert: Mensch*“ (www.unternehmenswert-mensch.de). In this respect, the audit “*Zukunftsfähige Unternehmenskultur*” [sustainable corporate culture] of the *Neue Qualität der Arbeit* [NQA, new quality of work] initiative must also be mentioned (www.inqa-audit.de). It is the first audit in Germany which is supported both by the employer associations and chambers, the trade unions, *Bundesagentur für Arbeit* and politicians. It is an offer that supports executive managements as well as employees in companies and public administrations in creating an improved working environment and thus initiate suitable measures for the comprehensive behavioural prevention. The audit aims at initiating sustainable change processes with the participation of the employees, thus improving the working conditions on a long-term basis. Finally, numerous programmes and initiatives exist in which the development of individual competencies plays a central role. Here, the actual objectives span from offers of narrow behavioural prevention measures up to individual stress management for employees to the development of health-promoting leadership skills and to the specific offers for occupational safety experts.

Accompanying counselling and support offers, e.g. “Persons as corporate assets”

Sample audit “Sustainable corporate culture”

Target groups of programmes and initiatives can be experts of company-internal and external occupational safety, entrepreneurs and managerial staff as well as their employees and representatives. Their tasks, responsibilities, options for action and influence differ just as the existing knowledge on the subjects of mental load and mental health. Effective practical offers are sensitive to this heterogeneity and base their offer formats on this. This is of particular importance with groups in whose professions as well as training and further education the subject does not necessarily play a role. In many cases, this applies to the target group of managerial staff as well as employees, particularly in small companies and where no systematic development of managerial staff takes place.

Audiences

It can also be differentiated between the existing programmes and initiatives with respect to their providers. These can be situated on different governmental and administrative levels (EU, federal government, federal states), in accident insurance companies, the health insur-

Sponsorship and actors

ance companies as well as a series of other actors from work-, health- or social-political associations as well as on the level of the economic and sector association and the labour unions.

What is to be particularly highlighted here are the institutions and initiatives in which partners with different approaches, competencies, responsibilities and tasks cooperate. On a EU level, the European Agency for Safety and Health at Work (EU-OSHA) is to be mentioned here, in which not only the governments of the European member states and the EU Commission cooperate but also employer and employee representatives are integrated in the strategic planning via the administrative council.

Initiatives directed at all actors with objectives in the areas of mental health also exist in a national context. What is to be mentioned here is the cooperation of the federal government, the employers and labour unions, which is not formally institutionalised but carried by the concept of a joint implementation responsibility and which takes effect in the “Joint declaration of mental health in the working world” of *BMAS*, *BDA* and *DGB* published in 2013. Other examples are the *Initiative Neue Qualität der Arbeit*, in which representatives of the industry and labour unions as well as of the Federal Ministry for Labour and Social Affairs and the conference of the ministers for labour and social affairs (*Arbeits- und Sozialministerkonferenz*) cooperate, as well as the previously mentioned *Gemeinsame Deutsche Arbeitsschutzstrategie (GDA)*, which is an initiative by the federal government, the federal states and the providers of statutory accident insurance.

The programmes and offers listed below were consciously chosen from the mentioned actor constellations and, based on their example, demonstrate the different objectives and target groups.

Table 17 Examples of mental load programmes and activities at the company level.

Level and actor	Objective	Target group	Example
European Union: EU-OSHA	Raising awareness	Employers and employees, focus on SMEs	Campaign “Health in the workplace – managing stress”
National: BMAS and social partners	Continued development of framework conditions and implementation of prevention at the workplace	All actors in the field of occupational health and safety in the workplace and across all businesses	Joint declaration on mental health in the working world by BMAS, BDA and DGB
National: INQA	Development and dissemination of solution approaches and instruments	Managerial staff, employee representatives, employees, consultants in different sectors and business sizes	PSYGA

4.2.4.2 European Agency for Safety and Health at Work

Among the main objectives of the campaign “Healthy Workplaces: Manage Stress” of the European Agency for Safety and Health at Work (www.osha.europa.eu), which was implemented from 2014 to 2015, were raising awareness and the improvement and distribution of knowledge with respect to stress and psychosocial risks at work. Guideline as well as numerous other materials were developed for the campaign, while the concrete implementation took place in the EU member states by the dissemination and publication of the campaign material, the organisation of seminars and workshops, the recommendation of the available instruments, a European competition for good practical solutions as well as the central events in the framework of a European week for safety and health protection at work. In parallel, digital “guidelines on the management of stress and psychosocial risks” providing information on work-related stress and psychosocial risks were developed and published. The guidelines are directed towards employers and employees in small businesses which deal with psychosocial risks at work for the first time and need support in the matter. It contains simple explanations on work-related stress and psychosocial risks, describes possible effects on the company and the employees and presents practical examples as to how risks can be avoided and managed. Finally, it refers to the national legal provisions as well further information offers and instruments.

European campaign
“Health in the workplace –
managing stress”

4.2.4.3 Joint declaration on mental health in the working world by the Federal Ministry of Labour and Social Affairs (BMAS), the Confederation of German Employers’ Associations (BDA) and the German Trade Union Confederation (DGB)

As a result of the discussion between the social partners and politicians, which was heavily influenced by the ordinance draft on risks caused by mental load presented by the *Bundesrat* in May 2013, in September 2013, the *Bundesvereinigung der Deutschen Arbeitgeberverbände (BDA)*, *Deutscher Gewerkschaftsbund (DBG)* and the Federal Ministry of Labour and Social Affairs (BMAS) signed the joint declaration on mental health in the working world (*Gemeinsame Erklärung psychische Gesundheit in der Arbeitswelt*). In this declaration, it is pointed out that the protection against health risks must be improved for ethical and economical reasons and that the knowledge regarding possible risks, their avoidance and the connected procedures is to be strengthened. In part III of the joint declaration, the activities of the federal government and social partners are indicated, with which they intend to further develop the framework conditions and the implementation of operational prevention measures. One focus here lies on the increase in the certainty of action in the implementation of measures which are to be promoted in particular by the provision of information and further education of company actors and the provision of guidelines on the implementation of the risk assessment regarding mental load and humane work design. In the implementation of the planned activities, the established coordination and cooperation institutions play an important role. For instance, the occupational safety institutions of the federal states and the accident insurance providers are integrated into the planned procedure in the *GDA* framework, while practical instruments and examples of good practice are developed and disseminated through the *INQA* project “Mental health in the working world (PSYGA)”.

Activities of the Federal
Government and social
partners

4.2.4.4 Initiative “New Quality of Work”

INQA company checks

In its four strategic areas of action, i.e. personnel management, equal opportunities & diversity, health as well as knowledge & competencies, the *Initiative Neue Qualität der Arbeit (INQA)*, which is supported by political and social partners, offers numerous aids for companies and employees. These include instrument for the assessment of the operational situation in the aforementioned strategic areas of action, guidelines as well as consultation and auditing programmes. Mental health and mental load subjects are dealt with and addressed in numerous *INQA* projects and the offers developed there, in particular in the company checks (*INQA* health check, *INQA* good leadership check) (www.inqa.de).

INQA project PSYGA

The most important element of the initiative on mental health in the working world is the *PSYGA* project with its comprehensive information offer and numerous practical guidelines (www.psyga.info). These exist in different forms for various sectors and target groups, e. g. managerial staff, occupational health management experts, employees. They address a broad range of subjects, from the design of change management processes up to the promotion of mental health by leadership actions, which are implemented by means of instruments, guidelines and practical aids. The sophistication and practicality of the offer, the integration of numerous cooperation partners and the support through public relations work of the initiative open up a multitude of opportunities for the dissemination of the offers, which is reflected in the great demand for the offered material as well as a generally great interest in the project and its results.

4.3 Discourse with occupational safety practice and politics

4.3.1 Holding of stakeholder discussions

In addition to the analysis of the problems with the topic construct “mental health in the working world” from the perspective of the company level (chapter 4.1), the question of the external relevance and validity of the scientific results arises. In particular, possible options for action should be derived and consolidated in cooperation with the occupational safety practice and politicians. Subsequently, a discussion process with relevant stakeholders of the expanded occupational health and safety was initiated – the third phase of the project.

The start of the third project phase, “applying the knowledge”, was realised in a two-day meeting of the Board of Trustees of BAuA¹, together with the committee of the Scientific Advisory Board of the project. On the second day, the intermediate results of the BAuA project as well as first thoughts of the meeting could be discussed with the Federal Minister for Labour, Andrea Nahles. The objective of the joined discussion was the focussing of the results, the systematisation of potential areas of activity and the review of actor constellations. The consolidated results of this discussion formed the basis for the further discussions with the relevant actor groups – in the following referred to as stakeholder discussions.

Representatives from the groups listed below took part in the stakeholder discussions:

1. Social partners

- *Bundesvereinigung der Deutschen Arbeitgeberverbände (BDA)*
[confederation of German employer associations] as well as other employer associations (e. g. *Gesamtmittel*)
- *Deutscher Gewerkschaftsbund (DGB)* [German trade union confederation] as well as individual labour unions (*ver.di, IG Metall, IG BCE*)

2. Occupational safety institutions

- *Länderausschuss für Arbeitsschutz und Sicherheitstechnik (LASI)*
[commission for occupational safety and safety engineering of the federal states]
- Executive committee of the work programme on mental health of *Gemeinsamen Arbeitsschutzstrategie (GDA)*
- Prevention managers of the accident insurance providers (*PLK*)
- 11. Occupational safety forum
- *Verband für Sicherheit, Umweltschutz und Gesundheit bei der Arbeit (VDSI)*
[association for safety, health and environmental protection in the workplace]

¹ Consisting of representatives of the social partners, federal states, trade associations, health insurance companies

3. Other institutions

- Control committee of *Initiative Neue Qualität der Arbeit (INQA)*
- *GKV-Spitzenverband* [federal association of statutory health insurance funds]

Usually, the stakeholder discussions were conducted as three- to four-hour meetings in the framework of a control committee, board of directors or similar board meeting of the respective group, in which the number of participants varied from 20 to 70. Based on the presentation of the central results of the project, the discussion concentrated on the allocation and assessment of the results against the background of the respective reference system of the stakeholders as well as the discussion of areas of and options for action. A list of all stakeholder discussions is attached in annex A3.

4.3.2 Notes from stakeholder discussions

4.3.2.1 Notes from stakeholder discussions with trade union representatives

Labour union representatives pointed out that the findings of the project further confirm the existing minimum standards of occupational safety and, in particular, the working time laws. With respect to factors for which the stipulation of limit values would not make sense, it was proposed to think about qualitatively specified “If -- then” statements, which could be binding for the work design. In this context, a reference was made to the ongoing discussion on a possible anti-stress ordinance. Furthermore, the significance of occupational-scientific findings in connection with the desire for concrete recommendations for practice was pointed out. In the framework of the discussion of the behavioural preventive measures and situational prevention, it was emphasised that situational prevention would be needed to enable behavioural preventive measures. Additionally, they added that it would be necessary to increasingly instruct the employees on the subject of mental health. They added that, since employees were increasingly co-responsible for the design of their work, the problem that they were often unaware of the possible consequences of their design actions on their health would occur. The lack of company physicians providing employees with information on health risks was also mentioned in this context. In order to improve the provision of information on the subject of mental health, they asserted, the training of health multipliers or ergonomics consultants in the respective company would be sensible. They added that, altogether, an improved occupational-scientific support of company initiatives and/or interventions would be desirable.

Additionally, the important role of managerial staff in the humane design of work was highlighted once again. However, in this respect, it was assumed that a great need for action still exists in the companies. It was further considered whether the management of mental health in a company could be improved with the use of operational indicators, e. g. on sickness absence rates.

Furthermore, it was pointed out that a public-political discourse on the mental health of employees would be required in order to use all prevention options beyond the limitations of the company. It was further highlighted that the operational social partners on site must deal with the subject in order to promote the mental health of employees.

4.3.2.2 Notes from stakeholder discussions with employer association representatives

In talks with employer representatives, it was emphasised that the findings of the project contribute to the objectification of the debate on mental health. It was furthermore discussed if subjective perceptions, such as the well-being or stress perception, could be included in occupational safety in the conventional sense and if a change of perspectives from the load to the stress assessment, in particular in the area of mental health, should be realised.

The participants highlighted the necessity of providing procedures for the determination of the mental work requirements and health consequences which are easy to implement in practice. Possible need for catching up and modernisation requirements of occupational safety were discussed. In particular with respect to the change of the working world, an improved positioning of occupational safety was regarded as desirable. According to employers, for instance, the traditional structures and instruments of occupational safety seemed to no longer have a sufficient effect in the area of new forms of employment; highly flexibly acting employee groups who are allowed distinct self-regulation competencies could only be reached with difficulties. In addition to the expert approach of occupational safety, standards for process actions should be developed, as well. Additionally, the request was made that the company-external occupational safety bodies, i.e. the statutory supervisory authorities and the accident insurance providers, should see themselves more as consultants for the companies since occupational safety relevant design deficits often appeared as operational organisation and work process problems.

4.3.2.3 Notes from stakeholder discussions with representatives of occupational safety institutions

In discussions with the occupational safety institutions, the results of the project were assessed as helpful and a target-group specific review of the findings was initiated. The necessity of a broadening of the scope of occupational safety – going beyond the avoidance of risks up to the humane design of work – and the improved connection with the discourse on the change of working world were emphasised.

Furthermore, the participants discussed the adaptation of the tasks and competency profile of prevention-related consultation and an expansion of the approaches to risk assessment. Despite the vast information material which is already available, they described the further specification and the review of scientific findings for operational practice and the derivation of criteria for the design of mental load as a central challenge in the future as well. Another subject was the use of project results for further work in the upcoming *GDA* period. The results shall be included in the strategic further development of the focal point on mental health of the work programme.

The central importance of the medium-level managerial staff as design actors was emphasised by this group as well. On the one hand, they have a significant impact on the working conditions of their employees; on the other hand, however, they are subjected to high work requirements themselves: Here, there is a significant qualification requirement. The discussion also addressed the self-exposure to risks of employees, in particular in the case of flexible working time and single-person businesses, for whom no regulations exist. Additionally, the objective of a holistic risk assessment, which includes both the physical as well as the mental load, was mentioned. Apart from the definition of key factors – as described in the report on the project – there was a demand for the identification of central load constellations to be

provided to the companies for analysis purposes. Here, it was also emphasised that, despite the existing comprehensive material on the subject, for small companies in particular, the subject of mental health has not been processed in a sufficiently comprehensible manner and is therefore hard to communicate. Several discussion participants emphasised the design responsibilities of the social partners in the field of mental load.

4.3.2.4 Notes from stakeholder discussions with representatives of the Federal Association of Statutory Health Insurance Funds and of the Initiative “New Quality of Work”

In the further course of the discussion, the design responsibility of social partners was increasingly emphasized with respect to the subject of mental load on the company level. The stakeholders expressly requested a further specification of the gained findings in order to translate the results into action and design options for company practice. The systematics of the working condition factors and their assessment as stress factors or resources was evaluated as helpful and necessary in several discussions. An evaluation of operational examples of a successful work design in the problem area of mental load was called for. This knowledge should be used systematically for building up practical design knowledge. The assumption of an optimisation compared to the strategy of minimizing work-related risks otherwise pursued by occupational safety, which underlies the design objective of individual working condition factors, has been confirmed. The question of suitable instruments and approaches not only to prevention but also for the reintegration of employees was also addressed. It should be strived for a cooperation between actors of occupational safety and operational health promotion in the companies.

5 Recommendations

With the project on mental health in the working world, the BAuA has analysed the state of scientific knowledge on the mental working condition factors. The objective was the analysis of association and design knowledge on work and health and to reflect on it against the background of the change in the working world and thus make a contribution on the proper and timely supplementation and further development of occupational safety and health. In the formulation of our conclusions and recommendations, however, we also wanted to go beyond the area of occupational safety in its narrower sense wherever this seemed appropriate from a professional point of view. Furthermore, relevant research gaps and ways to eliminate them were to be identified in the context of the project.

For this purpose, in project phase I, scoping reviews on the scientific state of studies were implemented. The results of these studies were discussed with scientific experts in project phase II and classified against the background of proven, occupational-scientific standards, in particular with respect to the design of work (e. g. prospective design of technical-organisational work systems) as well as the current findings of the changes in the working world. Depending on the working condition factor, this resulted in a range of general design information which has been proven in operational practice. In contrast, significantly less findings were gained in the area of the secured design knowledge. Subsequently, based on the intermediate report created from this, a discussion was held with the occupational safety actors in project phase III. At the same time, the findings were compared to the current status of occupational safety, as can be found in the evaluation by *Gemeinsame Deutsche Arbeitsschutzstrategie* (GDA) or the work of the statutory occupational safety committees, as well as to general programmes, initiatives and campaigns in the area of “work and health”. Based on the current survey data, finally, statements on the relevance of the working condition factors for employees could be made. In the now available completed report, the project results are presented and the concluding recommendations based on a prioritisation and overall evaluation by BAuA are formulated.

Here, in total and based on the project results, a great need for action in the area of mental health in the working world addressing the design and implementation deficits on an operational level is to be expected. In accordance with the present data, the mental working condition factors are decisive for the working conditions of many employees – in combination with other working conditions – and there are clear associations between unfavourable load constellations and possible health impairments. Similarly, it can be shown on the basis of these studies that well designed work, in particular with respect to adequate work-related resources, can indeed have favourable effects on the health and the ability to perform of employees.

However, on the other hand, when examining the anchoring of mental working condition factors in the routines of occupational safety, the company health management and other systematic processes and procedures of work design, these are still insufficient. As can be shown in the discussions in project phase III, the reasons for this are manifold and are understood very differently by the various actor groups. Similarly, a few central options for action can be identified which, in our opinion, are suitable for making a contribution to a better workplace implementation of a systematic work design in the area of mental working condition factors.

When deriving such options for action, a differentiated observation of the scientific findings is required since, as we have pointed out in the present report, the working condition factors examined by us are extremely heterogeneous and only limitedly suitable for a cross-factor, standardised systematic. If, for the association between work and health, relatively consistent associations can be identified across different studies, verified design knowledge for operational practice is only occasionally available so that design recommendations can only be derived with sufficient caution and care. Additionally, the clarity and the degree of specification of the findings with respect to the various working condition factors differ. This can be partially explained with the respective state of research: For instance, the scientific findings on relatively new subjects, e.g. mobility, are less consistent than those of long-term fields of research, e.g. working time or social relationships. Frequently, however, the nature of the factors themselves plays an important role in the fact that more or less concrete and verified association and design knowledge is available. Additionally, and this is particularly important for our research questions, different approaches to their operational design are available for the different factors, depending on their individual character.

For instance, the focus of institutionalised occupational safety (apart from accident risks) mainly lies on potentially critical factors for which, ideally, objective measurement instruments and standardised threshold values which must not be exceeded (e.g. for noise) and/or for which, generally, exposure is to be reduced as far as possible according to the technical standards (e.g. for hazardous substances), are available. For some part of the mental working condition factors, quantitatively defined load thresholds are available (e.g. duration of the working time) or at least possible from an activity-specific point of view (such as extra-aural sound effect). Similarly, the perspective of exposure reduction seems appropriate in some cases (for instance with respect to permanent attention requirements). More frequently, however, some quantitatively defined “threshold values” are not (cannot be) available here and instead of a reduction of the exposure, an optimisation of the work requirements is to be aimed at since – as is the case with work intensity – both overload as well as underload conditions are to be avoided. What is of central importance in this context, however, is the fact that a major part of the factors observed by us – mainly with respect to the latitude for initiative and decision-making – is to be regarded as work-related resources with a favourable association to health according to their primary character, which are to be strengthened in the sense of a health-promoting design of the working conditions and work relationships. Finally, it is to be taken into consideration that many mental working condition factors are heavily influenced by operational negotiation processes and social interaction as well as specific solutions for the organisation of work and are therefore only limitedly accessible by technical manipulations by experts.

Against the background of the statements in the above, we have reached a central premise of our considerations and recommendations: Our goal is not a (re-)definition of the working condition factors examined by us in a manner that they can be ideally linked to existing instruments and procedures of occupational safety or other systems. Moreover, our objective is to propose the most suitable approach corresponding to the relevance of the factor without excluding other, possibly additional, feasible approaches, based on the character of the respective factors – whether it is a stress factor or a resource, whether it is of a technical nature or primarily object of operational negotiations and/or social interaction, whether it is spanning across multiple activities, whether quantitative threshold values are possible or not, etc. Furthermore, we must face the generally multi-factorial interrelationship of multiple interacting factors and the highly specific nature of their activities in a suitable manner.

In the framework of our recommendations below, we therefore allow ourselves to address different groups of actors who, explicitly or implicitly, formally or informally, contribute to the design of health-promoting work – the actors of institutional occupational safety, social partners, managerial staff and employees, the actors in the area of prevention and healthcare. Similarly, we refer to various systems of statutory and regulatory provisions which are relevant to our research questions and which refer to the occupational safety as well as the company-external and company-internal participation, working time law or prevention. Options for actions which could be suitable for significantly reducing central implementation gaps and thus contributing to a health-promoting work design in the area of mental working condition factors are central to our considerations. Here, we identify gaps in knowledge and competencies provided that these can contribute to an improved implementation. The question of whether, and in what manner, the systems of statutory and regulatory provisions could be further developed by additions to the regulations is not assessed in the present recommendations but is subject to the further political discourse.

In the recommendations 1 to 6 below, we mainly refer to the four subject areas of “technical factors”, “working time”, “working task”, “leadership and organisation” and the corresponding scientific literature reviews of our project. In the recommendations 7 to 10, we then assume a general perspective with respect to instruments, procedures, professional roles as well as possible accompanying processes.

Recommendation 1: Continued development and complementation of technical occupational safety

In the first recommendation, we address the technical factors we examined: Noise, climate, lighting, human-machine and human-computer interaction.

The integration of mental aspects in the analysis and design of factors in the work environment and such human-technology interactions has not succeeded with satisfactory results thus far. If operational risk assessments are carried out, they usually refer to the protection of physical health. This way, hearing impairments due to excessive sound pressure levels, inappropriate physical stress due to insufficient lighting or risks of illness due to low temperatures can be avoided. This also restricts risks for mental health due to an inappropriate design of the environmental factors. However, the area of the manifestations of environmental factors affecting mental health is not sufficiently recorded. Generally, additional parameters are to be taken into consideration with respect to the mental load, at least for the factors of noise and light, in addition to the sound pressure level or illuminance. For instance, these refer to the perceived cumbersomeness due to environmental noise with a rather low level but significant disturbing effect (e. g. speech) or to the increased proportion of blue spectral components in lighting which can have a positive or negative effect on the circadian rhythms in humans.

In the case where companies do implement a risk assessment for mental load, this is frequently done in a separate process in parallel to the usual occupational safety procedure. In the framework of such process, the environmental conditions and technical factors are often only marginally included or not included at all, while psychosocial factors are examined primarily instead. In contrast, in “conventional” risk assessments – in which occupational safety officers are generally involved to a significant extent –, the technical environmental factors are mainly examined with respect to the risks for physical health, while the mental effects are often neglected.

In the interest of the overall analysis of the relevant impacts of working conditions on employees, the gap in the technically oriented risk assessment, in particular, should be closed, while a close information exchange with possible additional activities on the mental risk assessment should be established. In this respect, the responsible experts on the company level should be provided with more know-how, in particular in questions regarding adequate design. Therefore, the continued pursuit of activities for the further specification of operational protection objectives, which have been initiated in the past few years already – based on the corresponding starting points in the relevant ordinances –, is desirable, especially in the committees for workplaces and occupational safety. In order to ensure this proceeds in a sufficiently systematic manner, a general work planning can be set up and subjected to monitoring.

In particular for new subject areas, the committees should be continuously provided with additional scientific competency in the form of expert opinions and further research. This especially includes findings in the research on effects, for instance on the extra-aural effects of noise, as well as the development of possible design solutions. Additionally, aspects of increased spatial mobility as well as the further mechanisation of services must be continuously observed from a scientific point of view and evaluated with respect to a potential need for action.

Recommendation 2: Intensification of the prospective design of technical-organisational work systems

The technical work environments and work systems can often only be corrected with difficulties or at high costs if, for example, a need for action is determined in the course of a risk assessment. Therefore, if possible, the principles of the prospective design of technical-organisational work systems should be observed and the effect on physical and mental health as well as the social activities should be anticipated in the new planning or replanning of work systems. This requires the relevant expertise in the responsible planning staff as well as the integration of professional actors in occupational safety, in particular the occupational safety officers and company physicians. Generally, the integration of the affected employees can be of great additional use since work processes can be better anticipated and further, more specific employee-related requirements can be taken into consideration as well.

Technical-organisational work systems should not only be suitable for avoiding impairments but also offer sufficient latitude for a differentiated work design which is adapted to the employees' person. Additionally, if possible, they are to be set-up with a work design which promotes learning and development.

The significance of the learning- and development-promoting design is increasing in view of the ongoing digitalisation since the rapid technological development in the working world requires employees to continuously develop their competencies. On the one hand, "smart" work equipment, e.g. collaborative robots equipped with artificial intelligence, open up a large, beneficial latitude for design for human activities; on the other hand, they can go hand in hand with the risk of a marginalisation of the human subtask and a subsequent dequalification. Furthermore, modern technologies can both open up latitude for initiative for employees by designing procedures and cycles in a more variable manner or further increase the standardisation and compression of work processes.

Consequently, we believe that it is necessary that principles of a prospective work design with particular consideration of the learning and development options are implemented with the introduction of new technologies in companies. For this purpose, abstract principles of humane work design must be continuously specified further in a practice-oriented manner in order to be applied, in particular in corporate change processes in the framework of digitalisation.

Science and practice should cooperate closely in order to introduce the corresponding criteria into the subordinate regulations and standards. Via such media, not only those addressed by occupational safety, e.g. employers, occupational safety officers, safety experts and company physicians, should be targeted but also manufacturers of technical work systems, such as the company experts who are responsible for the planning and design of work systems.

Additionally, an increased focus is to be placed on participation processes in the change and new design of work systems. Technological innovations and their potential for improving work activities may fail due to a lack of acceptance – even if, at the same time, decisions on changes in the companies cannot only be made by collective, subjective opinions. It is therefore important that economically and technologically justified changes of work systems

are improved based on the knowledge and experience of employees – but also of safety and health experts – with respect to the functionality as well as the humane, learning- and development-promoting design. Integration can be realised e. g. in early stages based on the creation of scenarios or in the realisation of pilot work systems by means of a systematic return flow of experience.

Here, an adequate realisation of company worker participation in the context of Section 90, 91 *BetrVG* [*Betriebsverfassungsgesetz*, German industrial relations law] could also play a significant role. This would require the sufficient provision of up-to-date occupational-scientific findings which also reflect the change in the working world. As is the case with the design criteria mentioned above, additionally, principles of good process design can also be described in the subordinate regulations and standards.

Recommendation 3: Qualitative substantiation of task-oriented key factors and development of activity-specific design models

In the systematic design of working tasks – whether correctively in the framework of risk assessments, prospective in the planning of future work systems or in the operational design process of the day-to-day operations – we recommend to primarily concentrate on key factors. These are generally characterised by the fact that they either

- open up possibilities of influencing the design of one's own work as a central resource or
- can go hand in hand with a particularly great, impairing effect as a central stress factor.

By focusing on key factors, the number of the working condition factors to be taken into consideration in the design is reduced to a manageable size and the desired design objectives can be reached more easily. This method is further supported by the occupational-scientific finding that a humane design can already be achieved by processing a few central factors.

In the framework of the design of tasks, the central key factors are, as work-related resource, the latitude for activity at work in particular and, as stress factor, the work intensity and emotional labour.

The latitude for activity at work may refer to the decision making with respect to suitable procedures, the time disposition, the selection of work equipment or the selection of cooperation partners for achieving a work result. A low latitude for activity at work may have unfavourable consequences, while a high latitude for activity at work, on the other hand, goes hand in hand with favourable effects on health and the capability to perform and additionally promotes learning and personal development. One design objective should be an optimisation (instead of maximisation) of these latitudes. This also means that employees are to be qualified with respect to the recognition and the adequate use of their latitude for activity at work and, in particular, to be enabled to utilise these latitudes for the self-design of their work, for instance in handling activity-related stress factors.

The work intensity, which is the result of the work volume to be done in a specific quality and within a specific period, represents a significant element of every work system. Here, design measures should not aim at a minimisation of the work intensity – since this may lead to an underload and, consequently, to an inappropriate stress load – but generally an optimisation of requirements as well as, additionally, provide suitable latitude for activity at work to balance load peaks, for instance. In the course of the processing of tasks, short-term load peaks can be tolerated as long as the work intensity subsequently returns to a level which allows for the restoration of the performance prerequisites; longer phases in which the work intensity exceeds the psychophysical limits of employees and thus overstrains their performance prerequisites should be generally avoided.

Emotional labour represents another key factor of the working task since companies increasingly require their employees to show specific emotions. Additionally, the quality of interaction is becoming increasingly significant even with simple activities. Thus, emotional labour represents an element of every working task, predominantly in the service sector however. Here, emotions can act as work tool, e.g. to make the interaction with third parties (customers, patients, colleagues) more positive; however, they are also an object of work if the employee is required to show specific emotions. So far, research in this area mainly deals with the health effects of emotion regulation strategies, whereby condition-related design recommendations, for instance on rules for the representation of emotions or the targeted strengthening of social resources (e.g. social sharing) have hardly been examined: A significant need for research exists in this respect.

Generally, in addition to the existing occupational-scientific and occupational-psychological design principles, it seems sensible to also provide qualitative reference examples describing possible critical manifestations of key factors in order to simplify the analysis of the work situation and the derivation of design objectives on the company level.

In the operational design practice, it is also important to develop concrete design solutions based on the analysis, which, in accordance with the respective activity characteristics, allow for an optimisation of the requirements intrinsic to the task as well as of adequate resources, with the overall goal of managing these requirements and thus supporting the task's completion. For instance, in the area of personal services characterised by great requirements for emotional labour, corresponding support offers should be provided which preferably correspond to the professional codices. In conventional design areas such as production or logistics, however, the latitude for time disposition is decisive in order to suitably manage the requirements with respect to work volume and working time. In contrast, in areas of knowledge-based work, the strategy of limiting the latitude for activity at work in the sense of clarity of roles and objectives could play a significant role.

Companies should be provided with an increased amount of orientation knowledge to ideally support the development of their own concrete design solutions for their respective activities and/or their load constellation. Here, already existing practical approaches should be used and further developed. The formulation of qualitative guiding principles and concrete reference examples of a humane work design for important activity groups should be consistently continued and further intensified, taking into consideration existing design and intervention knowledge, in an activity (group) specific manner. Additional design knowledge which sufficiently considers current changes in the working world is to be developed.

First and foremost, a scientific method is needed: The continuation of research and transfer promotion programmes which deal with operational-practical testing and model projects is recommended. Positive examples in this respect include the *Initiative Neue Qualität der Arbeit*, which is supported by social partners, as well as the support programme “*Gesund – ein Leben lang*” – Förderung von Forschungsverbänden zur Gesundheit in der Arbeitswelt [life-long health - promotion of research associations on health in the working world] of the *Bundesministerium für Bildung und Forschung (BMBF)* [German federal ministry for education and research] (www.bmbf.de). Additionally, suitable transfer approaches need be further developed and tested to broaden existing offers, such as the audit “*Zukunftsfähige Unternehmenskultur*” [sustainable corporate culture], the *PSYGA* project or the *INQA* self-check tools. In particular, however, the industry-specifically oriented, important organisations, the social partners, the accident insurance providers and, last but not least, the companies are to be integrated in the development and distribution of such guidelines.

Recommendation 4: Limitation and participatory design of working time

In scientific studies, the working time is consistently shown to be a key factor in its effect on health. Here, the core dimensions of length, time of day and flexibility of working time are of central importance. In addition to the quantitative properties, significant qualitative features of the working time design, e. g. the predictability and planability, are highly relevant for the health and well-being of employees.

First of all, the working time determines when and for how long employees carry out their working tasks with their corresponding conditions. The further design of the working time in its core dimensions of length, time of day and flexibility, however, is relevant to the health of employees, irrespective of the specific design of tasks. For the working time duration, standardised threshold values are stipulated in the respective working time law; a long-term exceedance and/or non-observance of such threshold values may result in health impairments. Specifically, this refers to the amount of the weekly working hours, the daily working time as well as the duration of rest periods. Additionally, flexibility characteristics of working time, such as on-call duty or work on demand, show a significant unfavourable association to health. The regulations on such characteristics should primarily focus on a timely compensation and limitation of the amount in favour of health. The state of findings on the association between working time and health suggests that the existing statutory provisions are reasonable from an occupational-scientific point of view, irrespective of the work activity.

In addition to these normative aspects of the working time design, the employees' options of influencing the design of their working time are also of great significance. Predictability and the ability to plan the working time as well as possible marginal times, in the sense of permanent availability, are characteristics which particularly affect the interface between job and private life and are clearly associated with health and satisfaction. Even though operational day-to-day business might always result in situations which require a deviation from the planned working time for operational reasons, the work should generally be organised in such a manner that the employee can reliably plan their working times. This means that the working times are predictable for them. The organisation and planning of work is, in turn, a central task of the company management.

Against the background of the significance of the quantitative working time factors for health, we recommend paying great attention to them. Based on the existing provisions of working time law as well as the enforceability given through clear and measurable standards, it makes sense to anchor the subject of working time with a higher priority in the focal points of the occupational safety supervision, with the objective of controlling the compliance with statutory regulations more strictly and increasing the companies' awareness for an adequate design of working time. In this respect, the activities of *GDA* provide a good starting point.

At the same time, the resources resulting from a participatively designed working time are to be utilised. In this respect, the design competencies of managerial staff/decision makers, corporate social partners and employees should be strengthened. Professional competencies in the broader subject area of "working time", including the contested field of work-life balance, are to be conveyed, while fair negotiation processes on the companies' level but also in organisational units or work teams – with a specific responsibility of operational managerial staff – are to be established.

As basis for a "good" negotiation process, occupational-scientific findings should also be included in the negotiation of collective bargaining agreements/opening of collective bargaining agreements and, if applicable, operational processes should be accompanied with expertise (e.g. the INQA project "*ZuWaGs – ZusammenWachsen – ArbeitGestalten*" [growing together - designing work]).

Specific regulations, such as requirements with respect to the expanded work-related permanent availability or the design of flexible working hours, should generally be developed on the company level in concert with the social partners. Additionally, good operational models for balancing the flexibilisation interests of employees and the company under aspects of occupational health and safety should be evaluated and shared, if possible.

Therefore, we believe that there is an increased need for research in the area of operational implementation processes and strategies (e.g. via the scientific support and evaluation of collective bargaining agreements and internal agreements as well as their implementation). Additionally, increased research work should be undertaken with respect to the effects of flexible working hours systems on health and recovery.

Recommendation 5: Balancing work and recovery

In particular, the question of to what extent recovery is supported or impaired is central to the long-term health of employees. Among others, this depends on the requirements and resources of working time, e.g. the above-mentioned flexible working hours systems. The working task itself as well as the interaction between the various conditions of the working task and the working time also play a significant role.

A central characteristic of recovery is the detachment from work after work, the success of which particularly depends on how good work situations can be completed. It is particularly critical if such detachment from work fails over a longer period because work requirements such as high work intensity or emotional labour and/or interruptions or a shortening of rest

periods occur over a longer period and/or with high intensity. This causes a recovery deficit to build up, which can have negative health effects. Additionally, the compatibility of work and private life plays an important role with respect to the health of employees since a great perception of conflict between these life areas leads to less possibilities for recovery and a decreased capability to recover. With reference to a successful work-life balance, aspects of the working task and the working time, such as the increasing elimination of borders between work and private life, play an important role. For instance, the temporal compatibility might be better, while the mental distance from work deteriorates. In this respect, the preferences and competencies of the individual employees play a role.

At their core, our recommendations aim at enabling employees to find a balance of and draw a line between work and private life, which ensures sufficient recovery to avoid health consequences due to recovery deficits.

With respect to the design of working time, in particular, the reduction of work assignments and work contacts which lead to a shortening or interruption of rest periods, such as on-call duty or work on demand as well as a delimitation of (short-term) working time variability should be the focus. Regarding the working tasks, a permanently high work intensity is to be generally avoided. Additionally, it is about the design of specific work requirements which the employees cannot easily let go of, e. g. highly emotional requirements or frequent conflict situations. If these cannot be avoided for activity-specific reasons, their effects are to be buffered by work-related resources, e. g. support by colleagues and the managerial staff.

In order to achieve this, on the one hand, further clarification and sensitisation of managerial staff and employees on the associations between work, recovery and health and/or on the healthy design of work (or working times) are warranted. The appropriate design of the interaction of work and recovery is increasingly important in the context of the change in the working world. For example, the involvement of managerial staff and employees is advisable in order to identify concrete aspects of work which obstruct the recovery and to convey strategies for successful recovery, e. g. for setting borders. Additionally, the knowledge of social partners in the context of work (-ing time) – recovery – health should be strengthened so that these factors are increasingly taken into consideration in the negotiation of company agreements and collective bargaining agreements/the opening of collective bargaining agreements.

We believe that an additional need for research exists in particular with respect to questions of recovery as a central mediator for work and health. The interactions between different work requirements and resources from working task, work organisation and working time as well as the interaction of these working conditions with individual competencies of employees are of particular interest.

Recommendation 6: Strengthening managerial staff and employees as primary design actors

Numerous findings of the scientific studies evaluated by us refer to the significance of managerial staff for a work design which is beneficial to mental health. Here, the question to what extent principles such as communication and transparency, participation, avoidance of unacceptable social behaviour or guaranteeing organisational justice achieve real validity in the day-to-day life in the company is central.

This realisation generally refers to all leadership levels in the organisation, from strategic to operational leadership. However, with regard to the interface between the organisation and the individual, the operational managerial staff has a particularly significant role in the health-promoting work design. They are the first point of contact for the clarification of tasks and the provision of resources and, ideally, they have sufficient latitude in order to be able to optimise tasks, operating conditions or working time arrangements with respect to the specific needs of employees in the sense of a differential work design. Furthermore, managerial staff has an important function in the appropriate information and involvement of employees, especially in times of organisational uncertainties, e.g. in the framework of restructuring operations. Against the background of the continuously dynamically changing working world, the significance of these aspects will increase further.

Generally, managerial staff can thus provide important resources for the health-promoting work design of their employees. This is supported by the associations between employee- and task-oriented leadership and the low number of depressive disorders, increased motivation and performance, which are consistently reported in the scientific studies. However, the working conditions of a great number of managerial staff themselves are marked by severe stress factors, e.g. excessive working time or frequent disturbances and interruptions. Furthermore, the high level of diversity and flexibility of modern work teams poses great demands on the managerial staff.

In the interest of good occupational health and safety, therefore, equal attention is to be paid to the structural framework conditions of good leadership, e.g. appropriate scope of leadership or sufficient (temporal) latitude, as is the case with the professional and procedural competencies of the managerial staff. As one element of this process, we recommend the gradual agreement on codices of health-promoting leadership. These should both convey a general value orientation as well as include recommendations on standards of good leadership practice. In contrast to the conventional research on leadership, the main focus here would not be on the ideal leadership style but on leadership activities in the context of the concrete work design, taking into consideration the structural operational framework conditions of good leadership. In close cooperation with real-life practitioners, the scientific research should support corresponding initiatives by means of suitable studies, for which they should use already existing activities. The main role here is to be assumed by the social partners, especially by the employer associations.

We furthermore recommend increasingly concentrating on managerial staff on all hierarchical levels as a target group of occupational-safety related qualification measures, in particular if these refer to the subject area of “working world and mental health”. Among others,

this could be realised in the framework of the transfer of specific occupational safety tasks enabled by the *Arbeitsschutzgesetz*. For instance, the guidelines developed in the framework of *PSYGA* and various e-learning tools provide points of reference in this regard.

However, the employees themselves also have an important role in designing work. Due to their day-to-day handling of the requirements of the work process, they possess extensive, experience-based knowledge, both with respect to occurring (load) issue as well as, ideally, on possible solutions. This experience-based knowledge is used on a day-to-day basis in – often informal – practices for dealing with requirements by the employees but is only insufficiently integrated in processes of systematic preventive work design.

This idea is not completely new; however, against the background of the change in the working world, it is becoming increasingly important. Digitalised, interconnected processes, flexible working structures and complex interaction requirements demand increasingly autonomous decisions, self-management and creativity from many employees in carrying out their work. More and more employees even actively ask for this. In the context of the question regarding the mental load and stress character of the activity, the working person, their assessment of the situation, their competency to act and their behaviour are thus also increasingly in the focus.

This does not imply a step away from condition-related health protection nor a sidestep to measures for the optimisation of a self-referential, individual health behaviour. It is rather about the creation of the workplace preconditions for providing the employees with suitable latitude for the work-related self-design and self-control and ensuring they (can) utilise these in a manner which is favourable to mental health. Hence, both are necessary: To design the corporate organisation and its rules in a way that work activities promoting mental health are possible and, on the employees' side, the necessary competencies for the corresponding work activities are conveyed – by way of qualification but also by the provision of opportunities for the joint collective reflection on experiences. Such competencies can be effective not only in the individual work behaviour but also serve as a basis for a participation and change behaviour referring to the operational conditions of work.

Recommendation 7: Dialogue and design-oriented alignment of instruments and procedures

The recommendations mentioned above result in a series of conclusions with respect to procedures, instruments and processes to be applied to the optimisation of working conditions relevant for mental health at the workplace.

Especially those working conditions which are closely connected to interactional associations, e. g. latitude for initiative and decision-making or the predictability of and ability to plan working times, require adequate dialogue-oriented processes with the involvement of employees in order to identify and implement design solutions. Against this background, we believe that it is necessary to assess instruments for the risk assessment for mental load with regard to their sufficient support of these dialogue processes, provided that they are not shaped by spatial-technical factors.

This means, for example, that the specific nature of the recording of work conditions regarding the respective concrete work situations is to be assessed higher for operational practice than, e.g., the theoretical testing quality, generalisability or comparability. Additionally, pragmatic approaches should be preferred over elaborated but complex procedures. Last but not least, forms of dialogue, e.g. occupational safety instructions, participation-oriented workshops or health circles, which are ideally conducted together with occupational safety experts, should be integrated into the procedure at a central point. These support not only the identification and implementation of design solutions but can also contribute to the development of design competencies in employees.

Additionally, companies are taking precautionary measures and efforts are undertaken to effectively reduce the hazards posed by mental loads outside the area of occupational safety (and/or irrespective thereof). This takes place on completely different operational levels, in the working time and performance policies as well as in staff planning or qualification, as a task of thoughtful leadership as well as as integral part of professional practice. In the assessment of the operational implementation of suitable measures of preventive occupational safety – for instance through the occupational safety supervision –, these procedures and regulations, provided that they are appropriate, should be respected and transferred into a closer communication with the occupational safety actors.

We recommend placing an even greater, more systematic emphasis on the development of standards for good process design with respect to occupational health and safety than previously and to further develop the instruments and procedures in the above-mentioned sense. Here, the bodies of GDA and the offers of INQA (e.g. the audit “*Zukunftsfähige Unternehmenskultur*” [sustainable corporate culture]) could play a significant role. Additionally, it should be examined whether corresponding procedural requirements regarding occupational safety should be further specified via a “codification”, e.g. in the framework of standards or in a legal manner, in the subordinate regulations of statutory committees.

Recommendation 8: Establishing closer ties between primary, secondary and tertiary prevention

The primary prevention oriented design of the working conditions is still central to occupational safety and will continue to be so in the future. However, this approach requires an expansion towards a more systematic connection with secondary and tertiary prevention measures. Hence, it is to be generally assumed, that, in the companies and even with excellent performances in the area of primary prevention, a not insignificant number of people with mental issues (of any origin) are employed who, among other things, need support from the companies in the management of their illness.

With respect to the company interest in a continuous and long-term maintenance of the work capability of employees, it seems rather irrelevant for the justification of corresponding measure whether the mental impairments are work-related or mainly based on factors outside of the work environment. Additionally, in view of the health policies, it is to be noted here that a quick reintegration or – even better – continuous employment, generally makes a significant contribution to the recovery of the persons affected.

Therefore, the establishment and expansion of structures allowing for an early detection of occurring mental problems in employees and an active support of their handling are necessary. This aims at avoiding sick leave of the affected employees if possible or, if it has occurred, at achieving a quick and sustainable reintegration into the work process. This necessitates an interaction of genuine company measures (task and working time design, guaranteeing leadership and team actions which are suitable for the problem), personal counselling and support offers (also of a low-threshold type) and medical-psychotherapeutic care in the professional system. The targeted selection, coordination and control of suitable measures entails great challenges both with respect to the operational establishment and process organisation as well as regarding the cooperation and networking of the various relevant institutional systems (companies themselves including occupational safety officers, social insurance providers, providers of psychosocial counselling services, therapy facilities).

At least in the area of larger companies, an increased promotion and broadening of the existing practical approaches to occupational health management differentiating between needs for primary, secondary and tertiary prevention and allowing for a flexible utilisation and processing of the latter by systematically linking occupational safety routines, personal support offers (for instance of occupational health promotion) and, if applicable, therapeutic rehabilitative measures, seem necessary and expedient. For smaller companies, a quick and simple access to the information, offers and measures necessary for an effective problem handling is to be guaranteed by means of the establishment and/or expansion of suitable company-external support structures (e. g. competency centres of accident insurance providers, employee assistance programme (EAP)).

To promote the corresponding developments, different action levels must (and can) be used as starting point. In our opinion, one element of such efforts would be the increased use of the instrument of support through company physicians to address and handle issues of mental load and the impairment of employees, both in the context of the primary prevention oriented occupational safety as well as in the operational reintegration. Additionally, a closer interaction and coordination of the capacities and competencies of health insurance providers are to be ensured and their optional services in the area of prevention and health promotion, which are expanded by the *Präventionsgesetz* [German prevention act] are to be utilised. This would benefit both the occupational safety as well as the operational reintegration which, in view of the increased numbers of sick leave due to mental disorders, must be regarded with greater importance in practice. Furthermore, it is important that real-life circumstances in the area of activity of “reintegration” are empirically analysed and processed more thoroughly, criteria and existing approaches of good practice in the operational reintegration are identified and the preconditions for their broader implementation are created.

Recommendation 9: Continued development of the competence of professional occupational safety actors

To effectively support and strengthen companies and their central actors in the area of work and mental health, a targeted further development of structures, resources, procedures and competencies in the occupational safety system is required, among others.

With respect to a significant part of the supervisory staff and the company's prevention experts (occupational safety officers and company physicians), it cannot currently be expected that they integrate the subjects of mental load and mental health into their activities with the same confidence and matter-of-factness as is the case with conventional questions of occupational safety, e.g. accident hazards or environmental loads. Therefore, the qualification and the establishment of competencies in the subject area of "mental health and work" are to be promoted consequently among these actor groups. Here, ongoing activities and offers, particularly from the *GDA* work programme on mental health, the specific offers in the framework of *PSYGA* as well as the training and further education offers for occupational safety officers and company physicians, can be used as basis. The primary objective of these efforts must be enabling more occupational safety officers to recognise the operational need for action in the area of mental load, to open up companies for dealing with the subject matter and to identify practical solution paths.

Against the background of the high company specific nature of the adequate design of health-promoting work under the aspect of mental health – both with respect to concrete design solutions as well as corresponding participation processes –, possible capacity and competency deficits on the level of the company occupational safety organisation are to be regarded as particularly critical. We therefore recommend reflecting the prevention-related support of the companies according to *ASiG* and *DGUV* regulation 2 with respect to a possible further development in particular. Here, on the one hand, it is to be checked to what extent the companies should be granted the possibility of bindingly integrating additional experts in the area of occupational safety and health depending on their needs in addition to the occupational safety officers and company physicians. Additionally, we recommend entrusting central company actors, e.g. managerial staff or experts in human resources departments, with (sub-) tasks in the framework of the operational occupational safety based on a systematic and high-level qualification.

In order to better reach small companies, the specific benefits of the alternative support ("company model", "competency centre") should also be more extensively exploited. On the one hand, the contents for the alternative support model of obligatory entrepreneur training in the area of mental load factors and mental health are to be deepened in this context. On the other hand, the options for companies for receiving timely, competent and comprehensive counselling and support services when needed are to be further expanded.

Recommendation 10: Systematic expansion of knowledge of opportunities and limitations of action with regard to occupational safety and health

Numerous factors influence the design of health-promoting work conditions and impact the orientation, degree of implementation and effectiveness of corresponding measures. These impact parameters include company-external and company-internal organisation structures, processes and decision making processes as well as competencies, guidelines, interest and motive positions as well as mindsets of the different actors.

Studies which systematically examine the modes of interaction and interdependencies of the various impact parameters are not very common so far. Against this background, we believe that it is necessary to expand the interventional research as well as field studies on the operational design practice. Knowledge on the conditions under which interventions can be effective and sustainable are to be further systematised in order to further develop corresponding effects and framework models for the design and implementation of interventions.

Here, on the one hand, the evaluation of company-external and -internal interventions as well as the evaluation of operational projects with a model character should be intensified. For this purpose, evaluation concepts which appropriately consider the complex and dynamic social context in which the work design takes place are required. Additionally, criteria and standards for the categorisation of good workplace design practice are to be developed. In this respect, the work programmes and the general evaluation of the *Gemeinsame Deutsche Arbeitsschutzstrategie* as well as projects and network activities in the framework of INQA offer multiple opportunities for generating a broader practical knowledge, which is shared by business and institutional actors, via accompanying research activities.

Furthermore, a stronger focus is to be placed on the analysis and evaluation of internal regulations and routines with which companies – often independently from the systems and procedures of occupational safety – meet their requirements for a health-promoting work design. In the framework of field studies and, in particular, by means of qualitative research methods, findings as to how company processes operate, in which activity arenas they take place and what actors participate in them with which interests and roles can be gained here. In this context, the question of how and under which conditions the activities and instruments of institutional occupational safety actors functionally contribute to the further development of these company processes on the design of humane work should be examined as well.

Lastly, the change in the working world should be subjected to continuous monitoring and permanently evaluated with respect to the opportunities and risks for a health-promoting design of work.

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* The differentiation of the year specifications corresponds to the list of references to literature featuring project outcomes in Appendix A 5.

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1 Subject area “Working tasks”

Latitude for activity at work

(Authors: E. Bradtke, M. Melzer, L. Röllmann & U. Rösler)

Background

To exert control or influence is a primary motive of human behaviour (Dörner, Reither & Stäudel, 1983; Oesterreich, 1981). In the working world, this is reflected in the working condition factor of latitude for activity, which is a component of numerous models and theories of occupational science.

It is the objective of this expert opinion to emphasise the significance of latitude for activity at work for performance, motivation, job satisfaction and employee health, to highlight the point of intersection with complete activities and to clarify the importance of latitude for activity in the modern working world.

Method

For a summarising presentation of the current state of research, a literature search for systematic overviews (meta-analyses and systematic reviews) in the databases PsycINFO/ PsycARTICLES and PSYINDEX, as well as a manual search, were conducted. The searches identified 16 studies matching the inclusion criteria following several screening steps. A supplementary manual search for primary studies reporting findings on latitude for activity at work contrary to the expectations was also carried out. In association with the overview on latitude for activity in production work, the identified secondary and primary studies form the basis of the present expert opinion.

Outcomes

A majority of the researched studies confirms the expected main effect of latitude for activity at work, i.e. that comprehensive latitude for activity is associated with a positive impact on performance, motivation, job satisfaction and health, while little latitude has a negative impact on them. At the level of primary studies, however, individual empirical findings indicate that comprehensive latitude for activity at work is not necessarily associated with positive consequences of stress load. It is possible that the association between latitude for activity at work and health-related outcome variables takes a non-linear course.

With regard to the point of intersection with the concept of complete activities, it was confirmed that latitude for activity at work is a key requirement for the design of complete tasks. Concerning the current relevance of the working condition factor of latitude for activity, it has been found that, based on the current discourse on subjectivisation and autonomy in the working world, a significantly more detailed analysis of the factor is required both theoretically and empirically.

Conclusions and need for research

On the basis of the literature search underlying this expert opinion, it could be confirmed that latitude for activity is generally considered a resource in the context of work. This somewhat contradicts the identified primary studies, which report a non-linear association. Considerations regarding both the (measurement) methods and the content design play a role here and are discussed in the present expert opinion. However, empirical studies permitting reliable or generalisable statements on this question are lacking. This results in the following unresolved issues in the areas of conceptualisation and application practice:

- Primary studies permitting curvilinear assessments,
- A current meta-analysis ostensibly considering the latitude for activity at work,
- Development of a recording instrument fulfilling the demand for differential scaling,
- A theoretical model on the differential impact of latitude for activity at work – particularly against the background of the modern working world (and its empirical verification).

Overall, it is found that latitude for activity at work represents an important, but not the only leverage point in work design. The existence of latitude for activity at work, or its individual utilisation, can possibly be considered as a minimum requirement. They are a necessary, but not a sufficient condition for a work design which promotes learning and health.

With regard to latitude for activity in the modern working world, certain limits or framework conditions to be defined are gaining importance in order to prevent potential self-harm, and therefore a danger to health, in the workplace. The question must be asked, in this context, to what extent enlarged latitude for activity at work can be linked to stress loads which are new or have received little consideration so far.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-1a.html

Latitude for initiative and decision making, assignment variability (Author: P. H. Rosen)

Definition of the working condition factor

A theoretical substantiation of the working condition factor of latitude for initiative and decision-making, assignment variability can be found in activity regulation theory, as well as in the theoretical models known as the job characteristics model, the job demand-control model (JDC model) and the vitamin model. The JDC model and the vitamin model differ significantly, however, in their assumptions regarding latitude for initiative and decision-making and their consequences. While the job demand-job control model assumes that there is a linear relationship between the manifestation of the working condition factor in combination with work requirements and dependent variables, the vitamin model postulates relationship in an inverted U-shape between the autonomy level and the associated consequences. For instance, an increase in autonomy is initially associated with a health-promoting effect. A further increase will, however, lead to health impairment.

Measurement of the working condition factor

The models partly represent the basis for recording instruments of occupational psychology to record the working condition factor. The extracted studies make heavy use of subjective elicitation methods recording the work situation from the perspective of the employees. For instance, 65 % of the analysed studies apply a subjective measurement instrument to record one or more aspects of the working condition factor of latitude for initiative and decision-making as well as assignment variability. 20 % of studies use a version of the Job Content Questionnaire (JCQ). An objective recording of the workplace situation can be found in 17 % of studies. In these cases, however, the focus is on a description of the work system and not on the description of the working condition factor.

Insights on stress load and stress load consequences

Departing from the theoretical considerations, the studies extracted for this scoping review are assigned to three groups based on their operationalisation of the working condition factor: horizontal activity features, vertical activity features as well as features of the workflow. A horizontally enriched activity is characterised by the employee performing several structurally similar tasks, which permit variability only on a control level. A vertically enriched activity is characterised by requiring different skills to be employed on various control levels. Workflow design refers to features of the production process with direct reference to latitude for initiative and decision-making as well as assignment variability, such as cycle time or the manufacturing principle. Following systematic analysis of the literature, 106 studies were included in this scoping review. Overall, the extracted studies show for all three features that the dependent variable of health has been examined most often: With 65 studies, a clear focus can be distinguished here. The association between vertical activity features and health indicators has been examined most often, with 37 studies. The variables of motivation/job satisfaction are assessed in 26 studies.

With 18 and 19 studies, respectively, the variables of well-being and performance have been significantly less frequently examined in association with latitude for initiative and decision-making or assignment variability².

² As multiple answers could be given, the number of total studies does not add up to 106.

The feature of horizontal activity expansion and the health variables of depression or depressive symptoms show a negative association of average significance. The significance of associations with other health variables can be assessed as low.

In addition, associations of mostly low significance can be found for horizontal activity features with different measures of well-being, such as stress symptoms or anxiety. Particularly the absence of features such as scheduling or method selection latitude are only to a small degree associated with negative states of well-being.

Across all studies, the effects show a positive association of average significance between horizontal activity features and variables associated with motivation or job satisfaction. This shows that the existence of scheduling or method selection latitude as well as variability are associated with higher job satisfaction and lower fluctuation.

Only 6 in a total of 106 analysed publications include statements on horizontal activity features and performance parameters. However, only three studies make statements on statistical characteristics. Associations of average significance can be found between the implementation of workplace rotation schemes and the motivation to reduce workplace accidents. Overall, however, the findings on the existing associations in this context are not extensively verified.

The associations between vertical activity features and health indicators are overall mostly tendencies and associations of low significance. Associations of average significance can be found for the features of assignment autonomy as well as latitude for decision-making and mental impairments, such as individual aspects of burn-out. Associations of low significance show that the existence of vertical activity structures is associated with positive states of well-being, such as subjective well-being. The absence of these features is more often associated with negative states of well-being, such as monotony, saturation and fatigue.

The findings on the association between vertical activity features and motivation or job satisfaction of employees point in the same direction. Overall, associations of average significance have been found: Activities with vertical features in the form of autonomy or utilisation of skills are associated with higher job satisfaction and motivational aspects such as innovative behaviour.

Associations of low significance overall were found between the features of latitude for decision-making as well as assignment autonomy and performance variables such as workplace accidents, safety-related behaviour and work performance.

For the feature of workflow design, it was found overall that the features of workflow design described here have an impact on health. The significance of these associations should be assessed as low, however.

Due to the state of data available for this scoping review, no reliable association can be found between the features of workflow design and measures of well-being.

For the most part, only tendencies can be found for the combination of workflow feature and motivation/job satisfaction. However, there is an association of average significance between cycle time and job motivation (lower cycle time is associated with lower job motivation).

Overall, the state of scientific knowledge indicates that both horizontal and vertical activity features are associated with the considered dependent variables of health, well-being, job satisfaction/motivation and performance. Although it is conveyed that, across all variables, the associations with horizontal activity features (e.g. scheduling and method selection latitude) are somewhat more significant than those with vertical activity features or features of workflow design, the differences are not substantial. All three features should therefore still be considered in the future.

Consideration of change in the working world

The analysis of the studies extracted for this scoping review further shows that subjects describing the change in the working world, such as demographic change or the digitisation of work, are not frequently considered in the extracted studies. The variable of age is frequently used for model adjustment. The studies considering the variable of age in this way could not find a substantial age effect.

Design knowledge

The working condition factor of latitude for initiative and decision-making, assignment variability in itself represents a design feature of the working task. For this reason, particularly features of workflow organisation with an impact on the latitude for initiative and decision-making of employees are seen as designable aspects of work systems. The analysis of the studies shows that particularly lean production principles as well as the serial line organisation of production processes do not have any positive impact regarding the latitude for initiative and decision-making or the assignment variability. The organisation of production in the form of partially autonomous workgroups as well as flexible manufacturing principles, total quality management systems (TQM systems) or measures to improve quality, such as a continuous improvement process (CIP), on the other hand, can go hand in hand with increased latitude for initiative, decision-making and activity, as well as assignment variability. In addition, it has been shown for the specific design principle of workplace rotation schemes that its implementation positively impacts the mental health and well-being of employees. Simulations can also represent a suitable method of planning the implementation of workplace rotation schemes and analysing the consequences associated with the implementation of workplace rotation schemes. The concept of job crafting goes beyond the traditional design approaches and can be the result of a granted latitude for activity at work. However, no statements can be made on this based on the extracted studies.

Need for research

A more specific quantification of the features of latitude for initiative and decision-making or assignment variability than with the levels of high, average or low significance cannot be found in the studies. In addition, the vitamin model gets almost no consideration. The majority of studies assumes a linear cause-effect relationship between the latitude for initiative and decision-making and the different dependent variables. One study, however, reaches the conclusion that a high degree of decision-making authority is associated with an increase in alcohol-induced and depressive disorders. For instance, the authors conclude that latitude for decision-making should not be considered entirely as a resource, but also as a demand

put on the employees. The further review of any potentially existing non-linear associations between the working condition factor of latitude for initiative and decision-making as well as assignment variability and mental health therefore represents an important research field for the production sector. In the context of Industry 4.0, the impact of increasing digitisation and computerisation of the production process on the working condition factor of latitude for initiative and decision-making and the associated consequences for health also represent important research fields.

Overall, it can be found that the various aspects of the working condition factor of latitude for initiative and decision-making as well as assignment variability have an impact on the variables of health, well-being, motivation/job satisfaction and performance considered in this review. Although these association must partly be assessed as merely of low significance, they represent an important foundation for the derivation of design recommendations in occupational psychology. Unresolved research questions result primarily for the domain of model review (vitamin model) as well as for the impact of digitisation or new technologies on the working condition factor. Particularly in the context of production, future research must include a more detailed analysis of latitude for activity at work, while also focussing on its dependence on questions of skills and qualification.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-1b.html

Completeness

(Authors: E. Bradtke & M. Melzer)

Background

In the context of occupational psychology, the concept of completeness has been developed, on the one hand, in the context of theories on activity regulation (Hacker, 1973, 1980a; Volpert, 1974, 1987). Completeness is considered here as an integrative or higher-level working condition factor. On the other hand, completeness in terms of task identity is defined as one of the five central activity features of the job characteristics model (Hackman & Lawler, 1971; Hackman & Oldham, 1976). These two theoretically derived aspects of completeness are considered separately in the literature review. This is supplemented by studies focussing on job enrichment – a design approach closely associated with complete activities.

The objective of the literature review is to answer questions on the associations between the working condition factor of completeness and health, well-being, motivation/job satisfaction and performance.

The scoping review included those studies in which completeness in terms of activity regulation theories is examined as the joint existence of sequential and hierarchic completeness, also in terms of the job characteristics model.

This is supplemented by those studies in which job enrichment is intended as a design approach for complete activities and examined with regard to its relationship with relevant outcome variables.

Methods

The research was conducted using the databases PsycINFO/PsycARTICLES, Medline (via PubMed) and PSYINDEX, initially yielding 4,890 references. Following the exclusion of duplicates and by means of a title-abstract review, the full text of the remaining 753 studies was reviewed. This resulted in the identification of 95 studies matching the inclusion criteria. They formed the basis for the overview of associations between completeness and the outcome variables of health, well-being, job satisfaction/motivation and performance.

Outcomes

A majority of the included studies (N = 65) is based on the job characteristics model. A significantly smaller share of studies (N = 9) examined observed completeness against the background of activity regulation theories. The work design approach of job enrichment was examined in 21 studies.

A majority of the included studies is based on random samples as well as on a cross-sectional design. Task completeness was primarily elicited by means of self-reporting. The method applied most frequently by far is the job diagnostic survey (Hackman & Oldham, 1975, 1976). The data on observed completeness are based on condition-related methods. The applied methods include the activity assessment system (Hacker, Fritsche, Richter & Iwanowa, 1995) in its different variants, as well as the computerised method for psychological activity assessment (Pohlandt, Richter, Jordan & Schulze, 1999).

Different instruments were used to record the outcome variables. The insights on well-being as well as on job satisfaction and motivation are largely based on self-reporting. The insights on health and performance, on the other hand, are also based on objective corporate performance indicators, such as sick leave data or product quantity, in addition to self-reporting.

Overall, the empirical findings indicate a positive association of task completeness with health, positive well-being and job satisfaction/motivation. The latter has been extensively examined (N = 58).

In addition, the included studies indicate negative associations between task completeness and absenteeism as well as the intention to quit or to look for another job.

Regarding the outcome variables on performance, the state of findings must be assessed as inconsistent. Some studies provided evidence of the expected performance-enhancing effects of task completeness, while other studies do not report any significant or even negative associations.

The outcomes of the included studies examining the aspect of perceived completeness show that complete activities are positively associated with health, as well as with job satisfaction/motivation and performance. The empirical findings for the outcome variable of well-being are inconsistent, in part even contradictory, i.e. some studies report positive associations while others report negative associations with completeness.

The empirical findings of the studies on job enrichment confirm positive associations with health, job satisfaction/motivation and performance. By contrast, the outcomes of the three studies on well-being are heterogeneous, so that no statement can be made on the association of job enrichment and well-being on this basis.

The literature search identified only few interventional studies regarding design knowledge. For the design knowledge which can be derived, as well as for notes on work design from the studies without intervention, see the summary in Chapter 7.

Conclusions and need for research

Using the literature search underlying this scoping review, only few studies could be identified which examined completeness based on activity regulation theories. This is somewhat inconsistent with the frequent occurrence of this concept in international and European standards (DIN EN ISO 6385, DIN EN ISO 9241-210, DIN EN 614-2), university teaching as well as design recommendations and materials in workplace practice. This results in a number of unresolved questions in the areas of conceptualisation and application practice.

Systematic manual search: It can be assumed that the small number of researched studies on observed completeness is due to the fact that this concept is not frequently found in English-language publications (for historical reasons). In order to review this and identify further relevant findings, a comprehensive (systematic) manual search is required which must include, in addition to unpublished studies (dissertations, diploma theses, etc.) by the workgroups involved in the development and research of the concept of completeness (the Berlin School featuring Volpert and others; the Dresden School featuring Hacker and others),

a thorough revision and assessment of the literature the applicable standards (DIN EN ISO 6385, DIN EN ISO 9241-210, DIN EN 614-2) and regulations are based on.

Systematic literature review, meta-analysis: On the basis of the literature search, it has been found that neither a systematic review nor a meta-analysis are available which would explicitly examine the working condition factor of completeness (task completeness based on activity regulation theories). Particularly against the background of the comparatively high importance of the factor in research and practice of occupational science, there is much catching-up to do here.

Research studies on transferability, analysis level and interaction: It should be clarified to what extent the completeness concept can be adapted to work assignments for which no empirical studies could be found by means of the literature search. In addition, the question remains which unit of analysis the assessment of completeness (vs. incompleteness) of an activity should be based on, whether completeness has a beneficial impact on health, learning and/or personal development already at the level of smaller activity units, and which further working condition factors interact significantly with completeness.

Type of association between completeness and health: It remains unclear for both task completeness and observed completeness to what extent they are associated with health. For instance, Pössinger (1989) assumes a U-shaped course in agreement with the vitamin model according to Warr (1987). It would also be necessary to clarify the potential risks of incomplete activities in this context.

Measurement of completeness: From the point of view of application practice, the question needs to be answered for which fields of application (activity classes or professional groups) suitable instruments for the determination of completeness are still lacking.

Evidence for the effectiveness of workplace design approaches: Only few workplace interventional studies on the subject of completeness are currently available. It is therefore necessary to initiate, organise and evaluate according research and implementation projects. In addition, the question of specific recommendations for the design of complete activities for work assignments which to date have received little to no consideration needs to be answered in this context.

Completeness in the context of change in the working world: Against the background of the current debates on the subject of Industry 4.0/Work 4.0, the question arises how much attention the concept of completeness can or should be afforded regarding work design which promotes learning and health in the context of Industry 4.0.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-1c.html

Work intensity

(Authors: N. Stab, S. Jahn & A. Schulz-Dadaczynski)

Research question and objectives

High work intensity is considered a major stress factor in our (modern) working world. The present overview presents findings on the impact of work intensity on health, well-being, motivation and performance. Following a systematic literature search, 294 studies in German and English could be included in the review.

Definition of the working condition factor

The review takes the definition of work intensity according to Trägner (2006) as a point of reference. Trägner understands work intensity as the relationship between work quantity, work quality and working speed. The term “work intensity” is not frequently used in the literature, with authors using a multitude of other terms (e. g. job demands, workload, work overload). However, the recording instruments available in this context always include items which can be assigned to the categories of quantity, time, a combination of quantity and time, speed, difficulty/complexity of work, quality and unspecific items. In the context of the scoping review, the aspect of “quantitative requirements” (consisting of work quantity, work time and working speed) and the aspect of “qualitative requirements” (consisting of complexity, difficulty and quality of work) are highlighted and assessed in association with different outcomes. The scoping review focusses on the past ten years in order to describe recent working conditions. In addition, service activities are considered in order to present a relevant sector of the modern working world.

Measurement methods and accuracy

In the vast majority of studies, work intensity is recorded by means of personalised methods in the form of self-reporting. A large number of measurement methods is applied. Common quality criteria are reported in most studies, although some studies are lacking information on the applied measurement instruments or reliabilities. Dependent variables, such as health, well-being and motivation, are predominantly recorded by means of personalised methods. Sick leave times or cardiovascular parameters are generally determined based on conditions, using corporate data or applying various tool-based measurement methods. Performance data are often elicited based on errors or accident data, although the performance as assessed by the employees themselves and aspects of outcome quality are also considered.

Association with stress load consequences

A large number of studies can be found for the aspect of “quantitative requirements” considering different outcomes, such as mental health or symptoms and permitting assessments of the associations. Other outcomes, such as cardiovascular diseases, are examined in a smaller number of studies. Predominantly small to medium-sized negative effects are found which are associated with positive aspects of mental health, such as job satisfaction (longitudinal section: $r = .0$ to $-.26$; cross-section: $r = .08$ to $-.47$) or well-being (cross-section: $r = -.32$ to $.11$). In addition, primarily small to large positive effects associated with negative aspects of mental health, such as emotional exhaustion (longitudinal section: $r = .16$ to $.53$; cross-section $r = .01$ to $.61$), fatigue (longitudinal section: $r = .19$ to $.46$; cross-section $r = .11$ to $.57$), depression and anxiety (longitudinal section: $r = -.16$ to $.25$; cross-section: $r = .01$ to $.52$) as well as predominantly positive small to medium-sized effects associated with deperson-

alisation (longitudinal section: $r = .2$ to $.28$; cross-section: $r = -.01$ to $.39$) are found. Predominantly small positive effects associated with physical and psychosomatic symptoms (longitudinal section: $r = -.06$ to $.27$; cross-section: $r = .0$ to $.39$), sleeping disorders (longitudinal section: $r = .23$; cross-section: $r = -.07$ to $.41$) and sick leave times (longitudinal section: $r = -.14$ to $.14$; cross-section: $r = -.06$ to $.28$) are also reported. For the performance parameters, small to medium-sized negative effects associated with safety aspects are presented in the studies (longitudinal section: $r = -.18$ to $-.33$; cross-section: $r = -.09$ to $-.12$). Small to large positive effects of quantitative requirements and musculoskeletal diseases can be found (longitudinal section: $r = .0$ to $.21$; cross-section: $r = -.06$ to $.66$); although the number of available studies on this outcome is too small to permit a final assessment. The outcomes regarding motivation are very heterogeneous. The state of scientific knowledge would have to be improved to permit the assessment of the associations with further outcomes, such as cardiovascular diseases or cognitive performance. Due to the small number of found studies and a lack of longitudinal studies, no final assessment of the associations with outcomes can be made. A major insight gained through the review is that particularly quantitative requirements alone show significant associations with key outcomes, such as health and well-being, and not only in combination with latitude for initiative or latitude for initiative and social support, as frequently presented in the literature.

Design knowledge

A majority of design recommendations addresses aspects of work design, such as adequate staffing, task and rest break design, improved role clarity, a redesign of the work environment and the provision of on-the-job training opportunities.

Recommendations for managerial staff how to design work in order to create a beneficial work environment are also frequently found. Managerial staff should be trained accordingly so that they are able to provide their employees with high-quality support.

In addition, it is considered particularly important that employees are protected against the impact of excessive work intensity at the individual level by learning how to expand their resources. This refers almost exclusively to the resources of latitude for initiative and support. It can be concluded from the insights gained from the considered studies that increased latitude for initiative of employees regarding different aspects of their job can at least attenuate the negative impact of a high workload and can partly even contribute to high demands having a positive impact. These are design recommendations from individual studies, however. The overall analysis of the studies included in the review yields only few effects of interaction with latitude for initiative and social support, so that no attenuating effect of latitude for initiative or social support can be assumed in case of high work intensity for the time being. Another starting point consists of the organisation of different training measures, both for employees in order to e.g. strengthen their coping abilities, and for managerial staff in order to better enable the latter to recognise overload early and to initiate the appropriate actions. Workshops and training are rarely recommended in the form of singular measures, however, but are frequently mentioned in combination with other suggestions already discussed, particularly regarding a redesign of the work itself. As design knowledge is primarily derived from association studies, the conclusions and suggestions are those of the authors. Review and assessment of verifying interventional studies are still pending.

Unresolved research questions

How can the change dynamics of quantitative and qualitative requirements be represented?

The review as well as the literature yield findings indicating that at least quantitative requirements are not very stable over time. This should have an impact on the measurement of quantitative and qualitative requirements. It is unclear how change dynamics can be better represented. In some longitudinal studies, associations of changes to quantitative requirements are generally mapped across two measurement times and different outcomes. However, the measurement methods differ widely and are difficult to compare. General statements are therefore not possible here. Longitudinal sections should use more than two measurement times, and designs from diary studies should also be used more often to map short-term fluctuations (within-person effects).

When do quantitative requirements have a beneficial impact?

Individual studies describe quantitative requirements as challenging, but beneficial factors. The question is when quantitative requirements also show a beneficial impact and if this is only true for a limited time, i.e. a specific duration of impact should not be exceeded (e.g. very high, but foreseeable workload creating motivation).

Which moderators are relevant besides latitude for initiative and social support?

In the studies, interactions are generally reviewed for the combinations of requirements and latitude for initiative, as well as for requirements, latitude for initiative and social support, as they represent central components of the job demand-job control (support) model. A small number of studies shows that e.g. leadership and personality traits, age, gender, but also other working condition factors such as shift work, play a role. Future studies should focus more on this. Factors such as interruption of work, task variety or factors of working time should also be considered in this context.

What is the association between quantitative and qualitative requirements and outcomes (linear vs. non-linear associations)?

Some studies also report linear effects in addition to curvilinear effects. These are based on the notion that the association between independent and dependent variables initially increases, then either decreases again (additional decrement) or becomes saturated (constant effect) from a specific point. Warr (1987) illustrates this type of association in his vitamin model. The reviewed studies includes only little research taking into account curvilinearity. Therefore, there is further need for research here.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-1d.html

Disturbances and interruptions (Author: T. Rigotti)

According to representative surveys, work interruptions and disturbances are among the most significant mental loads in today’s working world. It is therefore not surprising that many research studies, particularly in recent years, have focussed on the impact of interruptions and disturbances at work.

This systematic literature overview illustrates the current state of research regarding the empirical evidence on correlates and effects of interruptions and disturbances. Despite many theoretical contributions and literature reviews on the subject, a comprehensive systematic assessment of the available empirical scientific evidence on the impact of interruptions and disturbances has been lacking so far. As the essential point of this systematic overview, the need for research is formulated and specific design options for workplace practice are stated.

Interruptions of work can be defined as a “short-term suspension of human activity caused by an external source” (Baethge & Rigotti, 2010, p. 9). Interruptions of work are generally due to an additional task. This means that interruptions do not only distract attention, but also require a decision to be made regarding how to handle the task causing the interruption (the task can be addressed instantly or later, it can be ignored or delegated to others). Finally, a return to the incomplete primary activity is necessary. These processes consume time as well as (mental) resources. Disturbances can be distinguished from interruptions primarily by two features. While interruptions constitute a distinct event, disturbances can also be continuous (e.g. construction noise). In addition, disturbances are not usually associated with additional working tasks. In the taxonomy of activity regulation theory, interruptions are therefore classed with regulation obstacles, while disturbances are considered regulation overload. Brief introductory references are made to further relevant theoretical models, such as the phase model of interruptions (Brixey et al., 2007; Baethge, Rigotti & Roe, 2015) and the goal activation model (Altmann & Trafton, 2002). Although the task switching paradigm fundamentally differs, with regard to the anticipation of tasks, from interruptions, which in most cases cannot be predicted, a brief side note is nonetheless included to illustrate the most important terms and findings of this research paradigm.

Searches were performed for the English key terms “interruption*”, “intrusion*”, “distract*”, as well as for the German key terms “Arbeitsunterbrechung*”, “Regulationshindernis*”, “Regulationsproblem*”, “Ablenkung*” and “Störung*” in the databases PubMed, Web of Science, WisO, PSYINDEX and PsycInfo. As some of the searches produced a very large number of hits (up to approx. 50,000 hits for “interruption*”), the conjunctive restrictions (AND) “work*” as well as (OR) “task*” were included as additional search strings. The first stage identified 2,159 potentially relevant publications. To begin with, sources with obviously irrelevant titles or abstracts were removed. This resulted in 603 initially remaining studies. The full texts of these studies were obtained and an open coding procedure was applied to roughly sort them into the categories of “experimental studies” and “field studies”. An inductive principle was applied to further categorisation procedures, which enabled an extension of the category classes in the process. Both experimental studies and field studies were categorised according to subject areas. This led to the exclusion of further studies (exclusion criteria for empirical studies were: Interruptions were not directly recorded, the underlying understanding of the construct of interruptions does not match the focus of the review, studies of clinical

samples; in addition, some press reports were still included at this stage which did not make any original empirical or theoretical contribution). More than half of the studies were excluded during this stage. In a final step, recent publications and conference presentations known to the author were included which were not (yet) registered in the literature databases. The literature overview ultimately included 304 studies.

Findings of experimental studies were reported next. These publications could be roughly subdivided considering the criteria of mental and physical stress load, recovery and performance.

Only a small number of studies could be identified for stress load indicators; however, these uniformly showed a negative affective activation by interruptions. With regard to performance criteria, a distinction is made between the considered aspects of interruptions. In addition to a dichotomous operationalisation (interruptions yes/no), the studies examined effects of interruption duration, the time of interruption, resumption lag and complexity of tasks.

Despite individual non-significant effects (in case of very simple tasks) of interruptions on performance indicators, the overall analysis comes to the conclusion that interruption negatively affect performance both for the primary task and the interruption task, thus increasing the perceived complexity of the overall course of action. The duration of the interruption, interruptions in the middle and near the end of task completion as well as the similarity of the tasks have an intensifying effect.

Field studies were assigned to the categories of descriptive studies, stress load/health, work performance and interventional studies. A large number of studies predominantly documented high rates of interruption in the healthcare sector, primarily in nursing professions, determined by means of observation. These studies are not suitable, however, to derive verifiable insights regarding the impact of interruptions on health or performance. In addition to highly varying definitions of interruptions of work, these publications almost always lacked any reference to theory.

31 studies could be determined concerning the central research question about the impact of interruptions and disturbances on stress load and health. These studies were categorised as cross-sectional surveys, multi-method studies, diary studies and longitudinal studies, as these study designs result in different outcomes and also differ regarding the method quality. Different samples were taken to identify correlative associations between interruptions and various subjective indicators of well-being and health. Outcomes of multi-method and diary studies further substantiate these findings. Initial longitudinal considerations could identify interruptions as a relevant predictor for the cortisol level as a stress indicator, as well as for reduced job satisfaction and increased occurrence of psychosomatic symptoms.

Field studies examined various performance criteria in conjunction with interruptions of work and disturbances. With regard to general performance indicators, the findings are still rather scarce and, in addition to that, inconclusive. An extension of the time required to perform the tasks (exceeding the total of primary task and interruption task) can be assessed as certain. The empirical data available on errors are also still rather scarce. The most studies in this category could be detected for medication errors in particular. Although interruptions were identified as a source of risk for medication errors in all 21 studies, a stringent causality could

not be established as of yet. There are some indications that interruptions and disturbances could increase the risk of accidents – as prospective study design are difficult to implement in this field, however, the reported effects should be treated with caution.

Interventions for the reduction of interruptions have been documented in publications almost exclusively in the healthcare sector. These studies point towards partly very simple and cost-effective measures (information signs, high-visibility vests, shielded work areas) for the reduction of interruptions and disturbances. Although generally positive effects of interventions are found (almost independent of the type of measure), the quality of the methods applied in these evaluation studies is substantially deficient, with some rare exceptions. For instance, a control group is lacking, the assignment was not randomised or only post-measurements were performed. Apart from a potential publication bias (unsuccessful measures are rarely published), there is still a further need for research here.

Despite the extensive research on interruptions and disturbances, some research desiderata remain: (1) Cause-effect relationships can be derived on the basis of experimental studies. It is questionable, however, whether these can be transferred to the real working world. Only very few longitudinal studies have been performed to date in the field, although these would be highly desirable to verify the cause-effect relationships. (2) It has been found that the differentiation of various characteristics and process aspects, as examined in experimental laboratory research, has been given almost no consideration in field studies so far. Field studies generally involved interviews on or the observation of the frequency of interruptions. Aspects such as the duration of interruption, resumption and interruption lag or complexity have not been considered as working condition factors so far. (3) Interruptions and disturbances have been primarily studied in healthcare professions. Comparisons between different activities and potential different “interruption profiles” could significantly expand our knowledge on differential cause-effect mechanisms. Little research has been done on (4) mediators between interruptions and disturbances and various outcomes, and (5) moderators, for instance as attenuators of negative effects or also as intensifying factors. (6) The study of specific strategies for the handling of interruptions and disturbances could contribute to an evidence-based development of behavioural approaches. (7) A number of interventional studies could be identified. However, the methods were deficient (no control groups, no randomisation, etc.), with a very small number of exceptions, and also were exclusively applied in the healthcare sector. More robust study designs, as well as interventions in different professional contexts, could therefore enlarge the current scientific evidence.

Finally, design and measure recommendations were derived. The assessment of the currently available studies, in my opinion, permits the qualification of interruptions and disturbances as a source of mental (over)load. They should therefore be considered as working condition factors, e. g. in the context of the assessment of dangers to mental health. A reduction of (unnecessary and preventable) interruptions is recommended in general. Specific design recommendations are made referring to the various empirical findings presented. As these are partly derived from findings of laboratory experiments and design knowledge from interventional studies is limited to healthcare professions, there is a need for additional research in order to obtain verifiable insights.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-1e.html

Emotional labour (Authors: I. Schöllgen & A. Schulz)

Research question and approach

The present review considers associations between aspects of emotional labour and outcomes in the areas of (mental) health and well-being, motivation and job satisfaction as well as performance against the background of theoretical models. A literature search assisted by databases identified more than 5,000 literature sources. Following a selection of the literature, five literature reviews and 123 more recent primary publications (2010 – 2014) have been considered in the analysis.

Definition and operationalisation

The key determining factor of emotional labour is the display of a specific emotional expression (or the suppression of inappropriate emotions) in the context of personal activities, i.e. interaction with third parties (customers, clients, patients).

In addition to the key aspects of surface acting (adaptation of emotional expression), deep acting (changing the emotional experience) and emotional dissonance (discrepancy between the required emotional expression and the actually experienced emotions), display rules and other conditional aspects of emotional labour are also considered in the present review.

Measurement methods and accuracy

As a rule, emotional labour is registered by means of subjective methods, with a number of validated questionnaires being available and mostly at least sufficient measurement accuracy being reported. Occasionally, display rules are also manipulated in the context of experimental studies.

Study description

The included studies are primarily cross-sectional studies, with samples taken predominantly in the traditional service sectors (wholesale and retail trade, accommodation and food service activities, tourism), human health and social work activities, as well as education.

Association with stress load consequences

Overall, it is found that the associations of surface acting (SA) with the burn-out aspects of (emotional) exhaustion and depersonalisation as well as job satisfaction can be considered verifiable (small to medium effects in each case), i.e. more frequent SA is associated with more intense burn-out and lower job satisfaction. The associations of SA with further indicators of negative mental well-being (e. g. distress; small to medium effects) have also been confirmed, and there are indications of associations of low-to-average significance with worse (subjectively reported) physical well-being and stronger intentions of quitting.

Most studies indicate that more deep acting (DA) is associated with somewhat less reduced performance (burn-out aspect; small effect). However, DA does not appear to show any (consistent) associations with further indicators of well-being. There is some evidence for positive associations between DA and emotion-related performance from laboratory studies and field studies with simulation of customer interaction, i.e. more DA leads to a stronger display of the desired emotional expression (or a stronger perception by others; small effects).

A study analysing both SA and DA combined suggests that the associations between DA and outcomes are moderated by SA.

It can be considered certain that stronger emotional dissonance (ED) is associated with more intense emotional exhaustion (medium effect) and stronger depersonalisation (predominantly associations of medium size) as well as with worse mental and physical well-being (small to medium effects), and that ED is detrimental to job satisfaction (primarily associations of low significance). Particularly the literature reviews available to date provide indications for an association of low significance between more intense ED and stronger intention to quit.

It can likewise be considered certain that stronger display rules (DR) concerning the suppression of negative emotions (or those perceived as stronger) are associated with slightly more intense (emotional) exhaustion (small effects). There is also some evidence from simulation studies that DR concerning the display of positive emotions go hand in hand with a somewhat better emotion-related performance (small to medium effects). One study indicated a non-linear association, i.e. a moderately clear expression of DR seemed optimal, while both lower and higher levels were detrimental with regard to the considered outcomes. Other aspects of emotional labour, such as intensity and variability of the emotional expressions, were rarely studied.

Impact of change in the working world

The increased examination of emotional labour over the past decades is associated with the change in the working world in terms of an increase of the number employees working in the service sector. Interaction beyond direct personal contact has been considered in studies involving call centre employees, for example. It must be assumed that the importance of this type of customer interaction (over the phone and/or via email, etc.) will increase further in the context of digitisation and growing international networks. It is of interest in this context how the existing options of monitoring by superiors as well as the utilisation of the various communication channels will affect things.

Design knowledge

Design recommendations with regard to display rules are difficult to derive due to the insufficient consideration of non-linear associations and the recording of data primarily by means of self-reporting in the majority of studies. In general, the causality of the found associations remains unclear due to the predominantly cross-sectional studies, i.e. it cannot be determined with any certainty to what extent, for instance, the negative associations of SA with well-being and job satisfaction actually represent detrimental effects of SA. Nevertheless, the recommendations in the studies frequently refer to surface acting and deep acting. For instance, it is recommended, on the one hand, to consider emotional regulation skills already in the selection of personnel, while it is recommended even more frequently to improve them by means of training. In addition, the design recommendations made in the manuscripts concerning working conditions primarily refer to other working condition factors, such as social support, latitude for initiative, relief through social sharing and rest breaks. It must be considered in this context, however, that the frequency of stating these factors exceeds their actual empirical investigation (and confirmation, primarily with regard to a moderating effect) in association with emotional labour.

Unresolved research questions

The following implications result with regard to future research: The (dynamic) interaction of surface acting and deep acting should be given more consideration. Higher-quality study designs like longitudinal studies are necessary in order to understand the causality of the relationship between emotional labour and well-being, motivation and job satisfaction as well as performance. To be able to derive more specific recommendations, it would also be important to examine the arrangement and the clarity of the conveyance of display rules in more detail and focus more strongly on generally designable factors in the association of emotional labour and outcomes. A more detailed analysis of potentially non-linear relationships between the aspects of emotional labour and the outcomes, particularly with regard to the derivation of guidelines or limit values, would also be important.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-1f.html

Traumatic stress

(Authors: I. Schöllgen & A. Schulz)

Research question and approach

The present review examines to what extent workplace factors or measures contribute to the attenuation or prevention (or also to the exacerbation) of the health consequences of a traumatic event in the context of work. The focus is on measures of primary prevention and urgent assistance, as well as on the support by colleagues and superiors as a potential key cause-effect mechanism. The focus of the outcomes in this review is on mental health and well-being. A literature search in databases and a manual search identified more than 9,000 literature sources. Following a review of the literature based on previously determined criteria, 50 studies were included in the assessment of the results.

Definition and operationalisation

A traumatic event involves the confrontation with actual or the threat of death, serious injury or danger to one's own physical well-being or that of others. Examples in the context of work are robberies at a bank or in retail, involvement of professional drivers in severe accidents and the deployment of rescue teams in case of catastrophic events.

Measurement methods and accuracy

To record traumatic events, lists featuring several events or unguided statements on events experienced in the context of work are sometimes used, although it should be considered whether all of the events reported here fulfil the criteria of a traumatic event. With regard to the outcomes, symptoms of post-traumatic stress disorder (PTSD) are often recorded, for which a number of validated questionnaires is available.

Study description

Most of the included studies examined measures of urgent assistance or social support in the context of work, whereas only two studies on measures of primary prevention could be identified. Measures of urgent assistance were primarily examined in the context of non-randomised group comparisons without previous measurement. The studies on social support are predominantly cross-sectional studies. Both studies in the field of primary prevention are experimental studies. The samples were in many cases taken among the following professional groups: Firefighters, police forces and rescue teams/first responders (various professions).

Outcomes

The studies in the field of primary prevention included resilience training, with differences in the detailed design. The training effects were tested in the context of the simulation of a critical event. This showed partly beneficial effects on well-being and performance. It could not be clarified, however, whether these measures would also be helpful in case of a traumatic event in everyday life and whether they contribute to the prevention of post-traumatic stress disorder.

The field of urgent assistance features predominantly studies on debriefings, i.e. structured (group)sessions providing the opportunity to talk about what had happened, mostly a few days after the event. The specific design of the debriefings, however, is not always clearly described in the studies. The findings regarding the effects of debriefings are very heter-

ogeneous, particularly with regard to PTSD (symptoms). Some evidence of negative (i.e. detrimental) effects is even occasionally found here. Even when more detailed outcomes (regarding well-being) are considered, the effects of debriefings are not clearly beneficial. It should be taken into account that the validity of these studies is often severely limited by their design (primarily non-randomised group comparison without previous measurement). Even a randomised controlled study suggests, however, that a group debriefing does not yield any consistent effects compared to psychoeducation and a group without any intervention. Only few studies are available on further approaches of urgent intervention (e.g. first aid focussing on mental health).

Some evidence of beneficial effects of work-related social support (primarily by superiors) can be found. It cannot be clearly derived, however, whether the effects are trauma-specific or when which types of support are helpful in association with traumatic events.

Impact of change in the working world

Traumatic stress in the context of work is increasingly attracting attention as an issue of occupational safety. It is questionable to what extent this is due to the more frequent occurrence of (potentially) traumatic events. This should rather be seen in the context of a higher interest in mental health in the working world.

Design knowledge

With regard to design recommendations, a majority of authors agrees that offering help soon following the traumatic event is important. This includes the provision of information (on responses to trauma, coping options as well as further assistance), instrumental support and the activation of (professional and personal) support networks as well as screenings in order to identify high-risk groups and offer specifically adapted interventions. Debriefings, at least in their original form, are predominantly discouraged. In addition, several studies recommend an increase in support provided by superiors and, if applicable, the intensification of training/interventions, although it is not described in more detail how this should be designed.

Unresolved research questions

Additional studies on primary prevention are required including baseline surveys and longer follow-ups, based on larger samples and explicitly registering the exposition to traumatic events in the context of work as well as PTSD symptoms. With regard to urgent interventions, the question must be asked whether more high-quality studies on debriefings (in the context of work) would be useful considering the available findings, which do not show any clearly positive impact of intervention, or whether it is more expedient to consider alternative approaches of urgent support, provided that these are available for clear operationalisation. Concerning social support, trauma-specific support should be analysed in more detail, if possible in the context of prospective studies.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-1g.html

2 Subject area “Leadership and organisation”

Leadership

(Authors: D. Montano, A. Reeske & F. Franke)

Research question

The present final report addresses two questions: (1) To what extent is leadership associated with the mental health of employees? (2) What is the role of selected leadership instruments in the context of leadership activities and the mental health of employees?

Methods

A systematic literature search was performed in the relevant databases PubMed (PMC), PsycINFO, PsycARTICLES, PSYINDEX (EBSCOHost) and WISO to find answers on the research questions. The search strings consist of three keyword categories covering the subject areas “leadership”, “workplace context” and “mental health”. Since none of the search strings yielded any results on the subject area of personal leadership instruments and mental health, the research was supplemented by a manual search of the databases PSYINDEX, Scopus and PubMed. The most important criteria for the inclusion or exclusion of the found literature were (1) the explicit investigation of leadership in terms of direct personal leadership in the context of work, (2) a focus on mental health, and (3) the format of the found literature (formats such as book reviews, chapters from teaching manuals, obituaries or similar formats were not included).

The present final report addresses the following features of leadership: (1) transformational leadership, (2) relations-oriented leadership, (3) task-oriented leadership, (4) destructive leadership, (5) interactional aspects of leadership, and (6) ethical/authentic leadership. On the other hand, the following outcomes of mental health were considered: (1) affective symptoms, (2) burn-out, (3) stress, (4) well-being, (5) good mental functions, and (6) health problems.

The reported associations between the individual features of leadership and the different outcomes of mental health were extracted and aggregated. Subsequently, the degree of evidence of the outcomes was assessed in accordance with the recommendations of the GRADE workgroup (Grading of Recommendations Assessment, Development, and Evaluation; see Atkins et al., 2004; Canfield & Dahm, 2011) and conclusions were made for a health-promoting design of the working condition factor of leadership.

Outcomes

In consideration of the inclusion and exclusion criteria, a total of 217 studies with 703 contained association measures were included or extracted with regard to the part of the scientific question to what extent leadership is associated with the mental health of employees. The studies have predominantly been conducted in the research field of organisational psychology and business management. The original main focus was primarily on the question of the mental processes arising from the work situations, such as motivation, perception and assessment of the behaviour of managerial staff, as well as the relationship quality of

the manager-employee dyads. Although the quality of the methods applied in the included studies is low to average and a certain overestimation of reported associations cannot be excluded, statistically significant small to medium effect sizes were found for the association between leadership and mental health of employees.

With regard to the part of the research question focussing on the role of personal leadership instruments in the context of leadership activities and the mental health of employees, it is found in summary that the number of studies directly investigating this research question is too small. Nonetheless, some findings indicate that performance reviews and performance-related remuneration as personal leadership instruments can lead not only to the potential fulfilment of organisational objectives, but also to a negative impact on employee health. In particular, the problematic relationship between the objectives demanded by the organisational leadership and the managerial staff on the one hand and the work products of the employees appears to be associated with an increased psychosocial workload, which can go hand in hand with demotivation, dissatisfaction, internal conflicts and reduced performance, depending on the specific organisational context.

In terms of occupational safety, the outcomes of the reviewed literature as described above can be summarised on the basis of the demand-resource model (Bakker & Demerouti, 2007). In general, the findings indicate that leadership as a resource includes the positive manifestations of transformational and relations-oriented leadership, high quality of manager-employee-interaction as well as – to a somewhat lesser extent – task-oriented leadership. From a statistical point of view, the positive impact of leadership on the mental health of employees has a small to medium effect. In contrast, leadership is considered a risk not only in case of so-called destructive leadership, but presumably also in case of insufficient or deficient leadership skills. The negative impact of destructive leadership on the mental health of employees also has effects of small-to-medium size. However, the found associations are practically of high significance, however, as nearly all employees have a manager and are therefore affected by positive as well as negative manifestations of leadership. Even if the association of leadership with health parameters is of low to average statistical significance, the former can therefore have an important positive or negative impact on many employees.

Conclusions

Existing primary studies have afforded as little attention to the cause-effect mechanisms of leadership, for example, as to leadership in clearly defined sectors of activity or for clearly distinguished professional groups. Although design recommendations on the working condition factor of leadership cannot be directly derived from the outcomes of empirical studies due to these deficiencies, it is nonetheless possible to identify the following features of healthy leadership from the determined correlations between leadership and mental health which can benefit a health-promoting work design:

- relations or health-oriented leadership – whereas purely task-oriented leadership does not have a maximum positive impact on employee health,
- transparent and respectful communication between managerial staff and employees,
- clear communication of the information and rules relevant for the individual employees,
- an encouraging leadership style which promotes creativity,

- priority of a participatory leadership style based on dialogue and latitude for initiative, as opposed to an authoritarian leadership style focussed on command and obedience,
- consideration of the fairness expectations of employees,
- consideration of the social and emotional needs of the members of the organisation, such as appreciation, self-efficacy and satisfaction with life, and
- strict avoidance or penalisation of all forms of destructive leadership.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-2a.html

Social relationships

(Authors: S. Drössler, A. Steputat, M. Schubert, U. Euler & A. Seidler)

The present scoping review investigates the impact of social relationships in the workplace on mental health, mental well-being and mental disorders, as well as on motivation, job satisfaction and performance. 123 longitudinal and interventional studies were included, as were systematic reviews from the period between 1 January 2005 and 9 March 2015.

The included studies single out harassment as a risk factor for impaired mental health as well as for reduced performance, commitment and job satisfaction. A lack of social support is most significantly associated with an increased risk of burn-out and reduced job satisfaction. Less research has been done on the consequences of social conflicts and social climate.

There is a clear need of interventional studies applying sophisticated methods and featuring sufficiently long follow-up observation periods.

Research question and definition of the working condition factor

The present scoping review investigates the impact of social relationships in the workplace on mental health, mental well-being and mental disorders, as well as on motivation, job satisfaction and performance. 123 longitudinal and interventional studies were included, as were systematic reviews between 2005 and 2015.

The working condition factor of social relationships was subdivided into the aspects of social resources and social relationships stress factors. Social resources were described by the features of social support (as a key concept of social resources) and social climate; both can therefore only be understood as resource in case of a positive manifestation. Harassment and social conflicts have been considered as features of social stress factors.

Although numerous empirical studies are available on the consequences of social support and social stress factors, the theoretical conceptualisation of these constructs is often less than satisfactory. Only social support has been included in a theoretical model (demand control-support model, Johnson & Hall, 1988; Johnson, Hall & Theorell, 1989). Highly demanding activities with little latitude for activity at work are perceived as stressful and are considered a health risk. Broad latitude for activity at work and available social support, on the other hand, represent resources for the handling of work requirements.

The concept of harassment (workplace bullying) lacks a consistent theoretical basis as well as valid compilation. So far, this concept has instead been approached descriptively, while an increasing number of sub-phenomena has been subsumed under broader terms in the past (e.g. harassment as only one form of workplace-related violence). References to the definition by Leymann (1990) are encountered frequently, which states that harassment occurs when a person is subjected to negative behaviour repeatedly or over a longer period (at least once per week over a period of at least six months) which originates from one or several persons in the workplace, and the person is not in a position to defend himself/herself against it.

For social climate and social conflicts, theoretical models are lacking entirely, and only a limited number of studies is available.

Measurement methods and accuracy

Social resources and harassment were self-reported in all studies. A majority of studies applied validated instruments (for social support partly referring to the entire social work environment, partly considering superiors and colleagues separately). The reliability of the scales (if stated) was acceptable to excellent. Only social conflicts were almost exclusively recorded by means of single items (proprietary constructs, but also adopted from validated methods). Duration and intensity of the conflicts were not collected, although they were partly classified by conflict source (superiors/colleagues).

The outcomes were predominantly self-reported, with scales from validated methods. Single items were frequently found for the collection of job change/intention to change jobs. Third-party reports were occasionally obtained for mental health (registry data on prescriptions for psychiatric medication issued by physicians), but were almost exclusively used to determine sick leave times (health registries, company records).

The features were mostly recorded at two measurement times one to three years apart. Half of the studies focussed on the general working population, with the rest being profession-specific samples (primarily from the healthcare sector). The shares of men and women in the interviewee groups varied depending on the involved professions. The return rates of the studies varied widely (between 20.0 and 99.8%), with partly very high drop-out rates which were not systematically analysed.

Stress loads and stress load consequences

In almost 40% of included studies with the outcomes of depression, distress and mental health, a statistically significant association with social support was found ($k = 10$ of $k = 26$): In this context, low social support was associated with a higher risk of depression, distress and impaired mental health. Associations for the outcome of burn-out were found in approximately 70% of studies ($k = 5$ of $k = 7$). Studies on the extent of the association of social support with fatigue ($k = 3$), anxiety, positive affection and quality of life ($k = 1$ in each case) were relatively rare and the findings are heterogeneous. In almost half of the studies ($k = 9$ of $k = 16$) on the outcome of absenteeism/sick leave, it was found that a lack of social support is associated with increased absenteeism. Job satisfaction also suffers if social support is lacking ($k = 3$ of $k = 4$). There were only isolated cases of change to another job, however ($k = 2$ of $k = 7$). Features such as work commitment, productivity, work ability and transfer motivation were only very rarely investigated and showed inconsistent results. For social support, no clear trend of a stronger impact of support by superiors vs. support by colleagues or of stronger associations in women vs. men could be found on the basis of the scoping review.

A majority of included studies single out harassment as a risk factor for impaired mental health as well as for reduced performance, commitment and job satisfaction. All forms of violence at work are associated with an increased risk of mental distress, depression and fatigue – in both men and women (examined in 21 studies). Impairment of sleep quality as a consequence of harassment was rarely studied ($k = 2$), with rather unclear results. Only one study each was available for alcohol consumption and burn-out, therefore generalisable statements are not possible.

A majority of studies on harassment considered reverse effects. It was found that the impact of harassment on mental health, mental well-being and mental disorders is stronger than vice

versa. Nonetheless, impaired mental health is also associated with a more intense experience of harassment. In addition, experience of harassment is associated with a reduction of performance, commitment, company loyalty and job satisfaction, as well as stronger intentions to change jobs or actual job change. This resulted in sick leave only in some individual cases ($k = 3$).

The consequences of social climate and social conflicts have been less well researched. The findings point towards an increased risk of development of depression in case of unfavourable social climate (examined in four studies), whereas only few studies with inconsistent results are available on the association with the outcomes of distress ($k = 2$), fatigue ($k = 1$) and quality of sleep ($k = 1$).

Evidence for an association between social climate and sick leave was found in two studies. No statistically significant effects were found for work ability and job change ($k = 1$ in both cases).

Only six longitudinal studies investigated the association between social conflicts and mental health, mental well-being and mental disorders. No consistent or clear detrimental effect of conflicts on these outcomes could be found, but it cannot be excluded either. In addition, the outcomes vary depending on the gender of the interviewees and on the type of the source of conflict (superiors/colleagues). This was highlighted in three of the studies on the subject. However, the findings do not point towards any system which would permit generalising conclusions to be made.

With regard to impact on sick leave ($k = 3$), effects of social conflicts were found, depending on the study, only for conflicts with colleagues and only over a longer observation period, or no associations whatsoever were found. In one study, social conflicts were associated with stronger intentions to change jobs.

In a part of the studies in this scoping review, the statistical significance of the examined working condition factors was no longer given if further workplace features were included in the analyses (e.g. job insecurity: Andrea, Bultmann, Van Amelsvoort & Kant, 2009; professional status: Rugulies, Aust & Pejtersen, 2010), which highlights the complex associations between the different psychosocial working conditions.

In summary, there is nonetheless sufficient evidence of a significant impact of social relationships in the workplace on mental health, mental well-being, mental disorders as well as motivation, job satisfaction and performance. This applies to both men and women, as well as to different professional groups. Social relationships are therefore important adjustment points in the field of health promotion in the workplace.

Change in the working world

The change in the working world receives almost no consideration in the studies included in the scoping review. For the analysis of the associations, it is irrelevant, for a start, to what extent the change in the working world leads to “improved” or “deteriorating” social relationships. Although the present scoping review was not explicitly designed with social relationships as an outcome in mind, the following statement can be made in consideration of the extensively reviewed literature: Insufficient research has been conducted so far on the

impact of change on social relationships in the workplace. It would be best to investigate this question by means of longitudinal studies or surveys over as long a time as possible. When organising such studies, it should be considered that the “traditional” instruments for the mapping of social relationships (to the extent available) may need to be adapted: Change in the working world can potentially lead to new “qualities” of social relationships. For instance, increased occupational mobility and work in frequently changing interdisciplinary project teams can lead to more volatile social relationships not connected with a specific job (cf. Kesselring & Vogl, 2010). It is possible that such conditions can only be mapped by means of instruments to be newly developed.

Verified design knowledge

Only 13 interventional studies were available (partly without control group), three of which expedited exposure reduction and, in addition, did not examine any changes in health and motivation. The knowledge of measures to exert an effective influence on the job features studied here is therefore comparatively rudimentary and should not be considered sufficiently verified. Derivations on design information are therefore also based on the results of the included observational studies.

It appears sensible to implement strategies on several levels and, in the process, combine general measures (e.g. process changes and team-building) with specific elements (e.g. training on coping with harassment):

- Organisational level: Integration into corporate culture, incorporation into AGS structures; securing and optimisation of framework conditions (e.g. sufficient personal resources); leadership training (e.g. giving feedback, coping with harassment, communication)
- Team level: Employee involvement, autonomy, cooperative work structures; offers for the promotion of problem and conflict-solving strategies
- Individual level: Strengthening individual mental health (e.g. relaxation and stress management training, career planning); availability of persons to contact

Unresolved research questions

With the exception of social support, consistent theoretical foundations, models and the according standardised instruments for their measurement are lacking, which currently makes it difficult to compare the studies.

A need for interventional studies applying sophisticated methods (cluster randomisation), investigating concepts founded in theory with a small selection of validated instruments and with sufficiently long periods of follow-up observation, in order to verify the effectiveness and sustainability of design measures. The development of multidimensional prevention and intervention approaches combining strategies at the individual level, group level and organisational level should receive more attention in the context of future research.

Conclusions

It is obvious that social relationships in the workplace play an important role for the mental health outcomes regarding motivation and performance analysed here, therefore representing an important starting point in the field of workplace health promotion. At the same time,

a high intercorrelation of working conditions was found, which makes it difficult to identify a single factor as “the” decisive determiner of health (cf. also Seidler et al., 2014; Thinschmidt et al., 2015, in press). For instance, working conditions (e. g. work requirements) can attenuate or amplify the impact of social stress factors and resources (and vice versa). In addition, mental disorders, mental well-being, but also motivation and performance – to a similar extent as e. g. musculoskeletal diseases (cf. Seidler, Liebers & Latza, 2008) – should be considered as determined by multiple factors.

A comprehensive concept for the design of working conditions would therefore be useful and promising, i.e. multidimensional approaches should be implemented, for instance focussing on the prevention of excessive work requirements, strengthening autonomy and latitude for decision-making, and improving the social climate.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-2b.html

Justice and reward

(Authors: C. Haupt, E.-M. Backé & U. Latza)

To assess the state of scientific knowledge of the impact on mental health in the working world, the associations of the two independent models of organisational justice and effort-reward imbalance (ERI)/reward are assessed with selected outcomes in a scoping review. The theories on the working condition factors and partly on outcomes and design knowledge are additionally presented.

Theory of organisational justice and fairness

In accordance with the theories by Colquitt (2001) and Cohen-Carash and Spector (2001), as well an expansion of the theoretical aspects by additional aspects used in the included studies, this review considers nine different aspects: (1) fairness/perceived justice; (2) justice; (3) organisational justice; (4) distributive justice/fairness; (5) procedural justice/fairness; (6) interactional justice/fairness; (7) interpersonal justice/fairness; (8) informational justice/fairness; (9) relational justice/fairness.

Theory of ERI (reward)

Reward is registered by means of ERI. The effort-reward imbalance (also called gratification crisis) distinguishes between the individual scales of effort and reward, a total of both scales, and “overcommitment” from the additional scale.

Literature search

The review documents the studies on organisational justice and ERI available from the year 2000 onward in conjunction with six outcomes (mental health; diseases of the cardiovascular system; diseases of the musculoskeletal system; well-being; work performance; and motivation). The literature search of the developed search strings was based on these six outcomes. The search string was used to search for (1) exposure (justice and/or effort-reward imbalance) and (2) one of the six outcomes and, as an additional factor, (3) the work context: At least one search term from the three areas would have to be included (operator “and”). An additional search string searched for reviews and meta-analyses.

5,827 abstracts of individual studies and 1,102 abstracts of reviews were read, while 556 studies and 60 reviews were checked for their suitability with regard to the research question. 350 studies (n = 138 on justice and n = 212 on ERI) and 33 secondary analyses (6 reviews and 1 meta-analysis on justice and 26 reviews on ERI) were included. As the reviews on ERI dealt with overlapping studies, only seven of them were assessed. The main reason for exclusion of individual studies was that no association between the exposure analysed in the scoping review and one of the desired outcomes was presented, but the working condition factor and the outcome were merely mentioned in the study.

Outcomes

A distinction was made between results on justice and results on effort-reward imbalance for the extraction of the included studies (detailed data extraction scheme (DES) for 54 studies; slightly reduced DES for 139 studies on justice; significantly reduced DES for 212 on ERI). AS 60 reviews were initially available on ERI and summaries of knowledge from study manuals were also available, the focus of preparation was on the results of the reviews, whereas the

studies were only considered for individual questions. In contrast, the results of all included studies and reviews were aggregated for organisational justice.

One result is the presentation of the applied measurement instruments for justice and ERI. The scales by Colquitt (2001) and Morman (1991), as well as the adaptations of these two scales developed by the authors, were used most frequently for measurement of justice. In contrast, ERI is in most cases recorded with the questionnaire by Siegrist (1996) or adaptations thereof. In German-speaking countries, the COPSQ (Copenhagen Psychosocial Questionnaire) for justice and the questionnaire by Siegrist for ERI are most commonly used.

The main outcome of the studies is negative mental health, particularly for ERI ($n = 150$ studies) and for justice ($n = 85$ studies, of which analysed in more detail $n = 38$ on burn-out and $n = 24$ on depression). Both the extracted studies and reviews on justice and the assessed reviews on ERI show largely homogeneous results confirming the associations of the two working condition factors with the outcomes.

25 longitudinal studies are available on justice. A majority of studies on justice investigated an association with negative mental health. Of 150 associations (including 18 longitudinal studies), 125 are indicative of an association, eleven argue against it, and 14 assessments are inconsistent. Burn-out and depression are the disorders/symptoms most frequently examined.

Overall, employees experiencing unfairness in the workplace seem to show a moderate to average correlation between burn-out (total value) and the individual scales of justice.

The direction of impact, i.e. whether organisational injustice increases the values/frequency of depression, or whether depression reduces the perception of justice, is unclear. Justice and effort-reward imbalance have an additive effect on depression, which means they appear to at least partly represent two different constructs.

Beneficial effects of organisational justice on positive mental health, such as life satisfaction and work capability, are considered in 26 assessments from 20 studies, with 21 assessments confirming an association, apparently no association in one case, and an additional four assessments yielding inconsistent results.

Little research has been done so far on the association between justice and cardiovascular diseases ($n = 9$), while the association with musculoskeletal symptoms is even rarer ($n = 1$).

Job motivation or job satisfaction is examined in 35 assessments from 13 studies, with 33 thereof arguing in favour of increased job motivation/satisfaction in case of perceived justice in the workplace. Performance is considered in 15 assessments, with 13 assessments arguing in favour of an association in conformity with the hypothesis (more justice, better performance). The results of the association between organisational justice and performance are homogeneous; the correlations are of no or low significance.

Although there are methodical differences between the studies (confounding factors, different operationalisation of ERI), the results on ERI presented here generally provide evidence in

favour of an association between ERI and the considered diseases, with a focus on depression, cardiovascular and musculoskeletal diseases.

Across expositions and outcomes, mainly nurses and teachers were interviewed.

Differences appear to exist between the prediction/validity of the individual scales of justice/fairness. However, procedural and distributive fairness were recorded most often, so that results for both aspects are also available for the subgroups of the outcomes, whereas interactional justice represents a newer aspect, which has been developed later compared with the established aspects of procedural and distributive justice, and consequently has been used less frequently. For this reason, it cannot be assessed which aspect has the strongest impact and should be given priority in design/changes to design. The measurement instruments for justice, effort-reward imbalance, burn-out and depression are described.

Justice: Non-service sectors are rarely considered. Associations between justice and cardiovascular as well as musculoskeletal diseases are rarely considered. Third-party assessments or other more objective measurements of working conditions and outcomes are rarely obtained; it is standard to record both exposure and outcome subjectively.

Design knowledge

The included studies feature little design knowledge; the illustrated recommendations are very general and not very specific for the examined exposures. Three approaches can be identified in the studies which form the basis for the perception of organisational justice: (1) Appreciation and respect of employees; (2) involvement in decisions, employee arguments being heard and the option to influence the decisions made; (3) transparency of decision-making.

According to the additionally researched studies and general texts on design knowledge, the recommended measures should be implemented at the leadership level: The line manager is the most important person for the conveyance of appreciation, communication and transparency. He/she should offer rewards/recognition (also financially), support and feedback. The promotion of employee health, by maintaining organisational justice, among other things, must be defined as a strategic objective of the company. Examples of suitable means are (leadership) training, employee surveys and health circles. The latter should be primarily preventive or prospective and only curative/secondary/tertiary if needed.

The risk analysis should include the identification and approaches for the reduction of mental load.

It is emphasised overall that investments in organisational justice and in an optimisation/minimisation of effort-reward imbalance pay off.

Unresolved questions

Many questions on the construct of organisational justice as well as on the outcomes, framework conditions and possible threshold values remain unresolved. To begin with, it must be clarified urgently how organisational justice (also objectively) in its individual aspects can be measured in a consistent and valid manner.

The included studies did not provide any answers on further comprehensive research questions from the project. No statements can be made on:

- exposure duration or threshold value
- framework conditions
- addition
- the outcome of well-being
- the influence of the different sectors
- the impact of age and gender
- the impact on duration of employment

Outlook

Hereinafter, it is important to prepare overviews of specific research questions following the scoping review and the collection of new data, as well as the organisation of high-quality long-term studies on the unresolved research questions in particular.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-2d.html

Atypical forms of employment (Author: L. Hünefeld)

Research question and objectives

A continuous increase in atypical forms of employment, such as contract employment, fixed-term employment or self-employment in a single-person business, has been recorded in recent years (Statistisches Bundesamt [Federal Statistical Office], 2015; WSI, 2015). One reason for this increase are changes in the economy associated with new demands for businesses. For instance, companies are pursuing a strategy of flexibilisation and dissolution of boundaries of working times, forms of work and employment (Voß, 1998) in order to better adapt to the demands of the market regarding workload and specific customer needs, among other things. In addition, the political deregulation of employment facilitates the spread of various forms of atypical employment. The latitude for flexibilisation of employment has been increased as a consequence of the Employment Promotion Act of 1996 as well as the so-called Hartz Acts.

The political as well as the scientific debate often includes the question whether atypical forms of employment constitute precarious employment and whether they are associated with health impairment. The current state of research on this issue is rather ambivalent. For instance, numerous studies conclude that atypical forms of employment carry an increased risk of precarity compared with normal employment. On the other hand, it has been found that the risk varies depending on the particular form of atypical employment (e.g. Brehmer & Seifert, 2008; Kalina & Weinkopf, 2008; McKay, Jefferys, Paraksevopoulou & Keles, 2012). The same is true for the question whether atypical forms of employment constitute an increased health risk (Vahle-Hinz & Plachta, 2014). The current state of research shows partly considerable uncertainty with regard to whether forms of atypical employment constitute a risk to (mental) health and, if yes, which forms of atypical employment are concerned. Accordingly, the present scoping review has considered the following question in more detail:

What is the association between atypical forms of employment and mental health, mental disorders, well-being, musculoskeletal diseases, cardiovascular diseases as well as job satisfaction, performance and motivation?

Definition and theoretical position

In this scoping review, atypical forms of employment have been defined in contrast to normal employment (Eurofound, 2009; Statistisches Bundesamt [Federal Statistical Office] 2014). A form of employment is considered atypical if it differs from one of the following criteria:

full-term employment; for an unlimited period; activity performed directly at the company with which an employment contract exists; dependent employment; integration into the social security system and/or only one employment contract.

Based on this definition, the following forms of employment have been included in the analysis:

Marginal employment (mini/midijobs), contract/temporary employment, fixed-term employment, part-time work, self-employment, self-employment in a single-person business/freelance work, casual work, on-call work, seasonal work, daily-wage work and multiple-job employment.

Marginal employment, casual work, on-call work, seasonal work and daily-wage work could not be considered in this scoping review due to the insufficient state of scientific research or inconsistent definitions in the existing studies.

To date, atypical forms of employment have primarily been theoretically positioned by means of theories of economic segmentation and sociological theories or concepts such as stress theories, the psychological contract concept or the concept of increasing precariousness. Based on this theoretical position, the present review assumed the hypothesis that atypical forms of employment are associated with an impairment of mental, physical and general health.

Method

A systematic search in pertinent psychological and medical literature databases was performed for the present overview. Due to the fact that meta-analysis on atypical forms of employment as well as health-related outcomes already exist which summarise the state of scientific knowledge up to the year 2000, exclusively manuscripts dating from the past 15 years (2000 – 2015) have been considered.

Contributions in German and English have been included, regardless of publication type (i.e. journal articles, book chapters, dissertations, etc.). 2,733 abstracts have been included for this period following a duplicate check. After review of abstracts and full texts, 247 studies on the association between atypical forms of employment and health as well as other measures of outcome (job satisfaction, motivation, performance) have been included. To assess the state of scientific knowledge, extracts were made in order to assess whether the associations are significant and what the direction of association is, and sample-weighted mean effects (Cohen's d) were determined for bivariate associations.

Outcomes

The in-depth analysis of the current state of research on atypical forms of employment and health as well as on attitudes yields different results for the different forms of atypical employment. The number of studies already conducted between 2000 and 2015 highlights that forms of atypical employment have received differing amounts of attention in the past. Fixed-term employment is one of the most thoroughly studied forms, followed by part-time employment and self-employment. In addition, the averaged effect sizes (\bar{d}) of the associations between different forms of employment and health and attitude-related outcomes vary significantly.

For the undifferentiated assessment of atypical forms of employment overall, small averaged effect sizes have been found for overall mental health ($\bar{d} = 0.25$) as well as mental and behavioural disorders ($\bar{d} = 0.36$), while medium averaged effect sizes ($\bar{d} = 0.61$) have been found for depression. In addition, all significant associations, with the exception of satisfaction, indicate that atypically employed persons more frequently report health impairment and reduced motivation as well as reduced work performance compared with persons in normal employment.

Small effects regarding the mean sample-weighted effect sizes can be found for fixed-term employment. They are found for sick leave ($\bar{d} = -0.24$) and mental well-being ($\bar{d} = -0.21$) and indicate that fixed-term employees less frequently report sick leave or impairment of mental well-being than permanent employees. Overall, the results for the associations are not always

consistent. The directions of associations concerning general and mental health are in almost equal shares as expected and not as expected. The directions of associations concerning the other meta-categories are predominantly as expected. This means that fixed-term employment is associated with less satisfaction, motivation and performance as well as employability and with stronger impairment of mental health.

There is a medium-sized effect for temporary and contract employment, with a \bar{d} of 0.63, regarding the association between temporary and contract employment and depression. In addition, small-to-medium effect sizes can be found for general health, burn-out, job satisfaction, motivation and subcategories of physical health. The direction of all significant results is largely as expected and persons active in temporary and contract employment more frequently report physical and mental health impairment as well as less satisfaction, motivation and performance.

Small effect sizes of $0.20 < \bar{d} < 0.30$ can be found for associations between part-time employment and depression and performance. The consistency of the associations indicates that part-time employment is associated with better health and higher satisfaction, with the exception of work-related attitudes and depression.

For self-employment (in a single-person business), statistically significant effects can be found with regard to sick leave, motivation and (overall) physical health. There, the effect sizes fall into a range between $-0.41 < \bar{d} < 0.24$, corresponding to averaged associations of minor significance.

An analysis of the consistency of the associations shows that the direction of the results varies depending on the studied dependent variable. While the results for the direction of association are mostly as expected for mental and physical health, a majority of associations concerning general health, satisfaction and motivation as well as performance does not point in the expected direction. Consequently, people self-employed (in a single-person business) more frequently report mental and physical impairment, but also better general health, higher satisfaction and motivation as well as performance compared with dependent employees.

For multiple-job employment, a small effect for sick leave is found with regard to the sample-weighted mean effect sizes. With the exception of a single study, the significant results point into the expected direction ($\bar{d} = 0.23$). This permits the conclusion that people employed in multiple jobs more frequently report impairment of general and mental health than persons with “only” one paid job.

Discussion/assessment

The methodical quality of the studies on the feature of atypical forms of employment can be described as average at best. As a majority of studies featured a cross-sectional design, distorting effects will probably occur which may lead to an overestimation of the effect sizes. In addition, the definition and operationalisation of atypical forms of employment varied widely between studies, so that it was not always possible to clearly assign them to a specific form of atypical employment. For some forms of employment, such as casual work, the definitions differed to an extent which made it seem not very useful to aggregate the results. A lack of differentiation between the atypical forms of employment in the existing studies can therefore lead to a partially incorrect interpretation of the results. In addition, of the 247 studies only

115 used scales to record the variables of the criteria. The reliability of an instrument generally increases with the number of items (Schnell, Hill & Esser, 1999). As more than half of all included studies only use one item for the operationalisation of the dependent variables, a lower reliability regarding the health and attitude-related outcomes must consequently be assumed. This lower reliability is equivalent to a higher measurement error, making the observed findings less reliable. In addition, it is unclear, based on the current state of knowledge, whether atypical forms of employment per se constitute a factor relevant to health or rather the associated working conditions or the subjective job insecurity, as only 19% of the studies take into account any potential confounding with working conditions and subjective job insecurity.

Need for research

A need for research regarding atypical forms of employments and health results on several levels. Generally, there is still a significant need for research concerning some atypical forms of employment, such as work on demand, marginal employment or self-employment in a single-person business. There is also a need for research regarding the moderators and mediators of the association between atypical forms of employment and mental health, in order to discover which effects on mental health are caused by atypical forms of employment, and which effects are dependent on the differential sample characteristics and working conditions of persons in atypical forms of employment. There is a likewise need for large-scale, high-quality longitudinal studies on the impact of atypical forms of employment on mental health.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-2e.html

Job insecurity (Authors: B. Köper & S. Gerstenberg)

The present report introduces influence factors and the impact on health of the subjectively perceived risk of losing one's job (job insecurity, abbreviated form: JI). The objective is to show (a) which influence factors trigger JI, and (b) particularly if, and to what extent, JI is significantly associated with mental and physical health. Another objective is to issue recommendations on the design of working conditions based on the reviewed literature which permit an attenuation of the occurrence and the impact of subjective JI.

Research question, theory, hypothesis

Against the background of the dynamic developments in the context of globalisation, deregulation and fragmentation of the job market, as well as the market and competitive pressure, JI has received increasing attention in recent years. It is closely associated with the adaptation of organisations to these environmental conditions in terms of partly drastic changes significantly altering the structures and processes in the organisations (restructuring). In consensus with the literature this report is based on, we understand job insecurity as the “perception of a potential threat to continuity in his or her current job” (Heaney, Israel & House, 1994; p. 1431), i.e. the subjective assessment that the continued existence of one's job could be in danger (De Witte et al., 2010). In the context of the project “Mental health in the working world”, this article addresses two questions:

- What are the causes of subjective (quantitative) JI?
- What is the association of subjective (quantitative) JI with health and well-being?

This article follows an exploratory approach regarding the first question on the causes or predictors of JI. Two theoretical approaches are relevant with regard to the second research question: In agreement with concepts on stress load and strain (Karasek & Theorell, 1990; Lazarus & Folkman, 1984; Johannes Siegrist, 1996), JI can be considered a stress factor associated with an impairment of well-being and health. In addition, the psychological contract theory (Robinson, 1996; Rousseau, 1989) considers job insecurity as a key aspect of the contract. Accordingly, existing JI would be perceived as a breach of the psychological contract, with negative consequences for the employees. Against this theoretical background, we assume the hypothesis that job insecurity is associated with an impairment of mental, physical and general health.

Method

A systematic search in pertinent psychological and medical literature databases was performed for the present review. As JI is a well researched and clearly defined construct, the search string could be kept relatively short; it said: “job insecurity“ OR “arbeitsplatzunsicherheit“ OR “job security“ OR “Arbeitsplatzsicherheit“ OR “employment uncertainty“ OR “job uncertainty“. The vast majority of studies on JI has been published in the recent past (Median, 2008). Since the turn of the millennium, there has been a sharp increase in published articles. We therefore decided to limit the search period to the years 2000 to (October) 2014 and to cover the findings published before this period by a systematic literature review (De Witte, 1999) and two meta-analyses (Cheng & Chan, 2008; Sverke, Hellgren & Näswall, 2002).

Contributions in German and English have been included, regardless of publication type (i.e. journal articles, book chapters, dissertations, etc.). 1661 abstracts have been included for this period following a duplicate check. Following a review of abstracts and full texts, 100 studies on the predictors of JI and 223 studies on the impact of JI were considered in the analysis.

Outcomes

On the basis of a total of 100 included studies, a multitude of different predictors for JI could be identified, which can be categorised by factors at the individual level, the organisational level or at the level of the whole of society. Socio-demographic and socio-economic aspects, motivational factors as well as personal traits were studied at the individual level with regard to their association with JI. Various approaches were also found in the studies focussing on organisational predictors of JI. A distinction could be made here between aspects of the organisational structure, aspects of work organisation, work situation, leadership as well as human resource management. A differentiation by economic, legal, cultural and social frames of reference has been proposed with regard to the (comparatively marginal) research on the association between JI and macro-level predictors.

223 studies were considered for the question of the impact of JI on well-being and health. We predominantly found associations of JI with mental health. Mental and behavioural disorders were studied particularly frequently, followed by mental well-being and burn-out. In the category of physical health, relatively many studies referred to musculoskeletal and cardiovascular diseases. Interviewees were also frequently asked for a self-assessment of their general health.

The share of significant associations in the three health-related main categories was highest for mental health with 76.6%, followed by general well-being (70.1%). For physical health, the share of significant associations was markedly lower, at 43.6%.

To check the consistency of the results, it was analysed to what extent JI in terms of our hypothesis was associated with health impairment. It was found that the associations were significantly more consistent for mental health and general well-being. With regard to mental health, almost 70% of associations showed significant results in terms of expectation, while this was only the case for 38% concerning physical health.

More obvious results for the association of JI with mental health impairment compared with the other dependent variables were also found with regard to associations of average significance. For mental health, a mean sample-weighted correlation of $\bar{r} = 0.2$ resulted, while the mean measure of association for physical and general health was found to be smaller ($\bar{r} = 0.14$ in both cases).

A number of included studies analysed the moderating effect of personal and organisational variables on the association of JI with various health-related outcomes. Primarily perceived control/latitude for initiative (Kinnunen, Mauno & Siltaloppi, 2010; Mohr, 2000; Schreurs, van Emmerik, Notelaers & De Witte, 2010), employment contract type (Kirves, De Cuyper, Kinnunen & Natti, 2011; Rigotti, de Cuyper, de Witte, Korek & Mohr, 2009), employability (Mohr, 2000), social support (Mohr, 2000; Plaisier et al., 2007) as well as corporate culture (Probst & Lawler, 2006) were found to be moderators of the association of JI with mental health which can be designed by the organisation.

With regard to design knowledge, explicit derivations for the design of working conditions could be found only in a few studies. Of the 223 included studies, only 95 studies considered recommendations for action or design. In the vast majority of studies (56), these recommendations were either phrased non-specifically or referred to general stress reduction measures. Only 39 studies specifically referred to the associations between job insecurity and its impact on employees. In these studies, the following design options were stated particularly often: Consideration of stress factors related to change, such as JI in case of strategic decisions, improvement of communication and transparency, improvement of participation options as well as measures to increase employability. These recommendations are largely consistent with optimisation notes for the improvement of change processes (Kieselbach, Beelmann & Wagner, 2009), which represent the most important framework condition for JI.

Discussion/assessment

The methodical quality of the studies on the feature of JI was low to average. As a majority of studies featured a cross-sectional design, distorting effects will probably occur which may lead to an overestimation of the effect sizes. For only 124 of 453 reported associations (27%), measures of reliability were provided for the applied scales, both of the independent and the dependent variables with regard to the data used in the study. Often – and particularly in the analyses of secondary data – only one item was used to record the independent variable (JI). Sverke and Hellgren (2002) show that this difference in measurement quality can impact the observed effect sizes. Accordingly, the found effects of JI were less pronounced in one-item measurements compared to instances of use of several items grouped into scales. This would result in a potential underestimation of the effect if single items are used.

An advantage of the heterogeneity of the underlying studies with regard to design and research question, which are due to the approach of the scoping review, is that our results are based on a large number of studies and associations. This implies, on the other hand, that the study quality is rather low and, based on various limitations, some overestimations and some underestimations of the effect sizes will result. The fact that our findings are consistent with existing meta-analyses featuring more stringent study quality requirements (Cheng & Chan, 2008; Sverke et al., 2002), however, can be taken as an overall indication that consistent, if rather minor associations exist between JI and the different outcomes (Cohen, 1992). The small-to-medium effect sizes of the associations do not mean, however, that the results would not be relevant to the health of employees and to a need for design. Depending on the prevalence rate of a working condition factor, it is already responsible for a significant share of cases – e. g. mental impairment – according to the concept of attributive risks (Kreienbroch, Piegeot & Ahrens, 2012).

Research questions

JI is closely associated with other working condition factors studied in the context of the project “Mental health in the working world”. This includes atypical forms of employment, organisational justice and leadership in particular. For this reason, it appears important to better map the overall association between these working condition factors as a process in order to determine on which basis JI develops, which consequences JI has and which factors at which point influence this process. The context of representation of this overall association also includes a stronger differentiation of the construct of JI (cognitive vs. affective JI; stronger focus on qualitative JI; JI as an individual vs. group phenomenon) or the explanation of differences in the impact of JI by cultural aspects as well as the importance of work. Another interesting

question could be whether the application of alternative theories and models would result in different design implications.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-2f.html

3 Subject area “Working time”

Atypical working time

(Author: M. Amlinger-Chatterjee)

Background and research question

For an increasing number of employees, consistent working time schedules are a thing of the past. Among other things, demographic changes, increased use of technology and the cross-linking of global markets have contributed to massive change and an increase in the variety of working time scheduling over the past decades. The “normal working time” of eight hours per day on average between 7 a.m. and 7 p.m. has diversified and has been extended more and more in the process. It has been replaced by working time systems which are called “atypical working times” despite their increasing prevalence. Shift work, long working hours, weekend working hours and flexible working hours are examples of such atypical working time systems. The design of working time schedules and framework conditions in which atypical working times are applied can impact mental health – depending on age, gender and participation options.

Method

The present report deals with the question to what extent atypical working times are associated with mental health. A systematic literature search in the scientific databases PSYNDEX, PsycINFO, PubMed and WISO was performed to answer this question. The studies were selected applying inclusion and exclusion criteria regarding atypical working times and indicators of mental health. Concerning the independent variables (or predictors), the studies referred to the working time systems of shift work, long working hours, flexible working hours and weekend working hours. Regarding the dependent variables (or criterion variables), indicators of mental health, general health/well-being, health problems, subjective experience of stress, affective symptoms, burn-out, substance use or abuse, sick leave or presenteeism as well as quality of mental functions were considered. Motivation, performance and job satisfaction may not be key aspects of mental health, but they still impact it. Similarly, although cardiovascular and musculoskeletal diseases are physical illnesses, they are closely associated with mental load and can be favoured or amplified by the latter. Accordingly, indicators of motivation, performance, job satisfaction, cardiovascular diseases and musculoskeletal diseases were also considered in the context of the presentation of results of secondary studies (i.e. of literature overviews, systematic reviews and meta-analyses).

The literature search was limited to the past 15 years, i.e. to publications since the year 2000, for the subject areas “long working hours”, “flexible working hours” and weekend working hours. Both the German Working Hours Act (ArbZG) in force since 1994, the Works Constitution Act and several decisions on the regulation of working time (e.g. decision of the Federal Constitutional Court on Sunday work) and the EU Working Time Directive (2003/88/EC) in force since 2003 regulate important aspects of working time design and form – at least in Europe – accompanying regulations for new developments with regard to duration, time of day, distribution, stability or regularity and predictability of working time as well as the dynamics of working time and rest periods. The ArbZG and Directive 2003/88/EC are therefore more

relevant for occupational safety and potential consequences for mental health than earlier working time regulations. With regard to the association between shift work and mental health, an extensive and up-to-date overview by the Norwegian Institute for Occupational Medicine (Statens arbeidsmiljøinstitutt) is available, which was published in 2014 and includes the latest findings of (epidemiological) studies up to 2012. The current scoping review therefore only includes primary studies on the factor of shift work published since early 2012, thus providing a supplementary update to the available overview by the Norwegian Institute for Occupational Medicine.

Outcomes

The findings from the primary and secondary studies on shift work indicate that there is a close association between night work, affective symptoms and an increased risk of exhaustion. Long night shifts exceeding twelve hours in particular appear to be associated with an increased risk of developing burn-out symptoms. In addition, the findings point towards a contribution of shift work to an increased risk of developing cardiovascular diseases. The interacting influences of tertiary variables, such as irregular eating and sleeping habits, should be considered in this context.

The state of scientific knowledge on long working hours shows that long working hours are particularly associated with more frequent health symptoms (such as headaches, dizziness, gastrointestinal symptoms) increased experience of stress and symptoms of burn-out. On the other hand, long working hours are associated with less sick leave (at least in cross-sectional comparisons). Although the data analysis of the primary studies shows that long working hours have only small to medium statistical effects on mental health, the effects are relevant in practice. Firstly, working time is already regulated by national and international legal frameworks, so that few data on extreme groups are available and potential effects are probably underestimated. Secondly, the present state of scientific knowledge suggests that the association between long working hours and mental health can be co-determined by other work-related factors, such as rest breaks, work intensity, work-life balance and leadership.

Flexibility referring to working time describes different aspects in the reviewed literature. Firstly, it can refer to the option of flexible working time design (i.e. influence on working time) by employees. This aspect therefore refers to the desire of employees to independently schedule their working time. Secondly, flexibility can be understood as flexibility as required by companies in terms of capacity-oriented variable working time (KAPOVAZ), thus referring to the availability of employees for work at different times. Thirdly, flexibility of working time can refer to the stability and predictability of working times. As different cause-effect relationships with indicators of mental health were to be expected for these three sub-aspects of flexible working time, a separate analysis was performed for each sub-aspect. More influence on working time was associated with better mental health. Both influence on working time and predictability of working time tended to be associated with less consequences of mental load. The observed findings with regard to working time variability were inconsistent, however: On the one hand, variability appears to be associated with impaired mental health, an increase in affective symptoms and an increased risk of burn-out. Nonetheless, some findings point in the opposite direction. On the other hand, the findings concerning on-demand work suggest an overall close association with mental load consequences.

The research on the specific impact of weekend working hours is relatively new and therefore the quantity of available literature is still rather small. Nonetheless, the included studies show a tendency towards an association between weekend working hours and increased experience of stress as well as an increased burn-out risk.

Assessment of the state of scientific knowledge and of the associations

A closer look at the existing primary studies shows that, firstly, many studies do not describe the specific design of the shift systems, the duration of working time and the extent of working time flexibility in any detail. This concerns the lack of distinction between long working hours and overtime hours. Secondly, the reported findings are largely based on cross-sectional studies. As cross-sectional studies rarely permit a causal interpretation, long-term cause-effect relationships remain largely unaccounted for. Thirdly, most data were collected from hospital staff (primarily nurses and physicians). The distribution of professional groups in the samples is not consistent with the observable distribution of professional groups actually working at atypical working times. Nonetheless, atypical working times can be assessed as a risk factor for health problems, for an increased experience of stress and for an increased risk of burn-out symptoms on the basis of the current state of scientific knowledge.

Unresolved research questions

Unresolved research questions result from the assessment of the state of scientific knowledge regarding the more specific description of working times, a lack of follow-up and longitudinal studies, and the fact that the shares of certain professional groups are over- or under-represented in the samples (see above). This is complemented by a need for research on interventions and the implementation of health-oriented working time regimes.

Design statements

The data considered in the scoping review only permit the derivation of design statements for the associations between atypical working times and key indicators of mental health. Important design statements take into account already existing guidelines and recommendations on working time design at the national level (Working Hours Act) as well as at the international level (EU Working Time Directive). In addition, the state of scientific knowledge highlights the fact that atypical working times are closely associated with organisational design aspects (e.g. structural framework conditions or budget and resource planning) and design aspects concerning the work situation (e.g. available latitude for initiative or rest break regulations). At the individual level, design aspects (e.g. on-the-job training offers) are also relevant which can mediate the association between atypical working times and health by means of potential mediators (e.g. work-life balance).

It should be considered, however, that a detailed discussion of design recommendations on working time reaches beyond the question of the present scoping review, and should be integrated into a debate on the cause-effect relationships of further work-related factors (e.g. work intensity, work-life balance or leadership), further load indicators (e.g. social participation, mistakes, accidents or physical illnesses) and basic social needs in the context of work (e.g. appreciation, social support and latitude for initiative).

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-3a.html

Rest breaks

(Authors: J. Wendsche & A. Lohmann-Haislah)

Research question and objectives

This overview considers findings on the impact of rest breaks (direct effects of rest breaks, impact of rest break regime, impact of timing freedom in rest break organisation, impact of rest break content and rest break location) on health, well-being, motivation and performance. In addition, influences of individual features and features of the work system are reviewed. Following a systematic literature search of employee samples in German and English (period: 1990 to 2014), the final sample of considered publications was $k = 157$. This includes $k = 10$ systematic narrative reviews, $k = 135$ primary studies with $k = 129$ independent samples as well as $k = 12$ publications featuring qualitative statements which were additionally used to derive design recommendations. Overall, the primary studies ($N = 87,891$) yielded 726 individual effects for encoding.

Definition of the working condition factor

The study of rest breaks is one of the oldest subject areas of occupational science. The term “rest break” is used to describe interruptions of work explicitly requiring that no work activities are carried out. They fulfil various functions, e. g. recovery, balancing of activities, motivation, social interaction and satisfying cultural and individual needs. Rest breaks can be conceptually distinguished from longer recovery periods outside of working time (e. g. rest period, weekend) and unplanned interruptions of work without organisationally intended recovery (e. g. wait times, interruptions of the workflow). They can be described according to different criteria (rest break regime, remuneration of rest breaks, rest break triggers, rest break content and rest break location). In addition, longer rest breaks as required by law are distinguished from rest breaks organised at the company level and covert rest breaks. A large number of theoretical models from working time, stress load and demand, recovery, motivational, emotional, cognition and learning research is available, providing detailed statements on the effect of these organisational elements. It should be assumed that activity-immanent (e. g. mental and physical demands), organisational (e. g. leadership behaviour, recovery culture) and individual (e. g. age, gender) features contribute to the impact of rest breaks.

Measurement methods and accuracy

The assessed sample of primary studies includes primarily interventional studies. These only partly fulfil the randomisation condition necessary for the derivation of causal statements. Due to the described multitude of determining factors for rest break organisation, these studies are partly only comparable to a limited extent. The problem continues with studies lacking intervention. In most cases, no complex analysis of rest break organisation is carried out here, so that alternative explanations cannot be excluded. The constructs of health, well-being, motivation and performance are mapped in the studies by a multitude of different variables. For this reason, a nuanced assessment of the study data seems necessary. Physical symptoms (e. g. musculoskeletal symptoms) and physiological reactions to stress are quite frequently used as health indicators. There are almost no studies available measuring both explicit indicators of mental health and objective diagnoses of physical symptoms. Scales on experience of fatigue and exhaustion, perceived effort and recovery as well as on positive and negative moods are used as indicators of well-being. The methods using questionnaires only rarely report psychometric parameters. In addition, they are often single-item measurements. Motivational constructs are reported in very few cases (in only 3% of studies). Widely differ-

ing methods are applied in the studies to collect performance data (predominantly objective data; quantitative and qualitative work performance, estimated work performance, performance in reference/secondary tasks, workplace accidents).

Association with stress load consequences

The studies predominantly include activities with dominant mental demands.

The direct effects of rest breaks were analysed in a first step. Short-break regimes (frequent rest breaks lasting less than 15 minutes) prevent musculoskeletal symptoms and – with a smaller effect size – psychosomatic symptoms and physiological destabilisation processes. In addition, protective effects impacting the experience of fatigue, mood and work performance were found. The last findings clearly show that short breaks associated with a reduction in actual productive total working time do not result in a loss of productivity. The study results also show that a longer overall recovery time is associated with reduced physical symptoms. The beneficial effects of short break regimes on health indicators were more pronounced in physically demanding activities. Almost no indication of effects of the rest break regime on variables of well-being and motivation could be found. It is not possible, on the basis of the available findings, to define generalisable recommendations on optimal rest break regimes for specific activities.

The studies also show that there is no difference between the effects of self-organised rest break regimes and those organised by third parties. An exception in this case are preventive effects of self-organised rest breaks on the extent of physical symptoms.

Little evidence was found overall that active breaks and recovery breaks differ in their impact. Partly found differences are presumably due to activity features, with an indication of the advantages of compensatory rest breaks. Such context factors have rarely been studied so far, however.

There are some indications that social breaks are associated with higher job satisfaction and stronger organisational loyalty. The impact on variables of well-being is inconsistent, however. Advantages of collective rest breaks appear to arise when they implicate balancing of activities (e. g. if there are few interaction options during work).

Both the performance of work activities during rest breaks and of activities with very high self-control requirements have a rather negative impact on well-being.

Only four studies on the impact of the location of recovery were considered. There were indications that rest breaks in nature are associated with improved mood, while rest breaks at the workplace limit subjective recovery.

Some newer studies focus less on explicit recovery activities during rest breaks and more on mental recovery processes. There are some indications that self-reported recovery during the rest break is associated with improved well-being as well as with higher intrinsic motivation and job satisfaction.

Napping breaks promote physiological restitution, as shown by five studies. Another five studies yielded evidence of a reduction of experienced fatigue. Almost no impact on perform-

ance results from this, however. It must be taken into account that the findings were obtained mostly from shift work (particularly night shifts). It cannot be assessed with any certainty if such positive effects also occur in napping breaks during the day.

Change in the working world

Against the background of the current debate on change in the working world, e. g. regarding age (e. g. increasingly aging workforce with a simultaneous increase in age diversity of professional groups) and gender distribution of the workforce (e. g. increasing labour participation of women), forms of occupation (e. g. freelance workers, single-person businesses), working time (e. g. part-time employees, multiple jobs, shared duties, on-call duty, trusted working time), location of work (e. g. teleworking, working from home, mobile work) and work contents (e. g. information processing, knowledge-based and interpersonal activities), an adequate organisation of rest breaks to attenuate potential negative stress load consequences of these factors has been gaining in importance. However, these factors have only rarely been studied directly, and above all not with regard to their reciprocal effect, in association with the impact of rest breaks. There is an urgent need for research in this field. The studies considered here show, however, that rest breaks can achieve effects of recovery also in modern work activities with predominantly mental work requirements. At the same time, it appears that the implementation of the legally required minimum rest break times is deficient with excessive frequency in some sectors. For this reason, both the validity and the applicability of the framework limits (total duration, divisibility, time) formulated in the Working Hours Act regarding the taking of rest breaks and the requirements for break rooms (Workplace Rule A4.2) should therefore be urgently subjected to an empirical review taking into account the working conditions stated above.

Design knowledge

Due to the available scientific evidence on the beneficial effects of rest breaks regarding health, safety and performance, daily breaks should be ensured and their cancellation should be prevented. It appears sensible to divide the overall duration of rest breaks into shorter and more frequent breaks. Limit values on the design of rest break regimes depending on the type, extent and duration of the stress load are unavailable to date and require further research activity. Some evidence was found arguing in favour of total rest break time as an essential indicator of recovery. For this reason, it should be studied in more detail whether the current statutory limits for rest break times are sufficient for activities with predominantly mental demands. A conclusive assessment of the advantages and framework conditions of self-organised rest breaks and those organised by third parties is not possible to date. Control and feedback measures could potentially reduce the observed high prevalence of cancelled rest breaks. The available findings indicate that there is no difference in effectiveness of passive rest breaks and those involving physical activity. In addition, there are numerous findings concerning the potential optimal design of passive (e. g. napping, relaxation exercises), activating (e. g. intake of caffeinated drinks) and physically active (e. g. stretching exercises) recovery contents. Only few study and design information was found on the impact of the rest break location. The findings show that leaving the workplace during rest breaks is associated with better well-being and a stronger experience of recovery. For this reason, it should be endeavoured to perform a review of the current rules of occupational science for certain jobs (e. g. exclusion of separate break rooms for office jobs as per ASR A4.4) and to integrate verified insights from other subprojects of the research project “Mental health in the working world” (e. g. noise, climate, lighting) as well as to consider beneficial effects of natural

surroundings for recovery and collective breaks. Some studies provided detailed notes on how managerial staff can optimise the organisation of rest breaks in their area of responsibility. However, the effectiveness of these recommendations has not been verified to date. There were some indications that individual features (e.g. age, gender, health) and organisational as well as activity-related features moderate the effects of rest breaks. These findings argue in favour of a “differential rest break organisation” in terms of the work design approach by Ulich (2011) as well as of the required consideration of rest break organisation in the context of holistic risk assessments. For this reason, the impact of other features of the work system on rest break organisation as well as its feedback effects should be considered for work and organisational design.

Unresolved research questions

A meta-analytic integration of the effects of short rest break regimes is recommended first of all. One largely unresolved question concerns the impact of rest breaks on longer-term indicators of mental health, diagnosed physical illnesses as well as motivational variables. The comparability of studies in the field of rest break research is limited by the numerous interacting determinants of rest break organisation. Measurement instruments should therefore be developed which permit the complex analysis and assessment of rest break systems. In addition, the moderating effects of working condition features and personal features on the impact of rest breaks should be studied in more detail. A recent study by the Federal Institute for Occupational Safety and Health (BAuA) showed that the longer rest breaks required by law are frequently cancelled and that this is associated with an impairment of health and well-being. The existing theoretical and empirical gap to the basic mechanisms (antecedents, process variables, moderators, consequences) of rest break cancellation should therefore be closed by means of targeted research activities. This also applies to the necessity of a comprehensive survey of rest break organisation in Germany.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-3b.html

Detachment

(Authors: J. Wendsche & A. Lohmann-Haislah)

Research question and objectives

In recent years, mental detachment from work during rest periods has been determined as a significant parameter of individual recovery. The objective of this meta-analysis with $k = 73$ independent employee samples ($N = 30,236$; $k = 71$ peer-reviewed publications in English; period: 1998 – 2014) as well as an assessment of $k = 11$ secondary studies was to clarify to what extent detachment from work is associated with stress load consequences (health, well-being, motivation performance). In addition, it was studied which associations with potential antecedents (work requirements and resources, performance of work activities during rest periods, individual features) exist.

Definition and operationalisation

The factor of detachment from work (psychological detachment) includes both physical and mental distancing from work. Detachment not only represents a potential condition factor for health, well-being and performance, but is itself a potential stress load consequence of working condition factors. The term is treated in quite different ways in the literature. For instance, the time horizon (orientation towards the past, the present or the future), dimensionality (as the “mental preoccupation with work” vs. the “detachment from work”) and valence (negative, neutral, positive) of work-related thoughts vary in the conceptualisation of occupational psychology. We will take up these constructional aspects in the present article, but will limit the scope to recording periods during the rest period, i.e. between two workdays/shifts. We will operationalise mental detachment from work here as an independent process variable for the relationship between working condition factors and short-term to long-term stress load consequences. Thinking about stressful things is, however, also a feature of different other general (e.g. rumination, worrying, negative affectivity/neuroticism) and work-specific (e.g. workaholism, overcommitment, incapability to recover) personal constructs. We have taken up these assumptions here and report the independent variance shares of excessive commitment to work, job involvement and negative affectivity/neuroticism in detachment.

Measurement methods

Detachment from work is almost exclusively recorded by means of questionnaires, in most cases using the Recovery Experience Questionnaire by Sonnentag and Fritz (2007; 54% of all encoded studies).

Measurement accuracy

The internal consistencies of the applied scales were $\alpha > .80$ on average. The measurement accuracy of the studied antecedents and consequences of the target construct can be assessed as adequate overall (all mean $\alpha > .70$). Except for the determination of physiological correlates (e.g. blood pressure, cortisol in saliva), records were mostly self-reported. No indications of a limitation of the validity of our results due to publication bias were found.

Sample description

The mean age of the study population was 39.4 years; the gender ratio in the studies was balanced on average. A majority of integrated findings has been taken from European samples. The studies were primarily conducted in the form of cross-sectional surveys or diary studies.

Outcomes – Association with stress load consequences

The analyses show that mental detachment from work during the rest period is positively associated with the studied indicators of well-being fatigue ($r = -.43$), rest period ($r = .32$), affective well-being ($r = .30$) and physical health, i.e. absence of physical symptoms ($r = .26$). The size of these effects is to be assessed as primarily medium-sized according to Cohen. Predominantly medium-sized effects were also found for indicators of mental health: sleep ($r = .34$), life satisfaction ($r = .32$), well-being ($r = .32$) and exhaustion ($r = -.40$ and $r = -.26$, respectively). No associations with physiological health factors could be found, probably also due to the low number of studies. An inconsistent result was found for the associations with indicators of motivation and performance: The analyses show slightly positive associations with task performance ($r = .09$), slightly negative associations with contextual measures of performance ($r = -.13$) and no significant associations with indicators of motivation. Potential curvilinear effects have been discussed as an explanation.

Outcomes – Association with key antecedents

The analyses show small negative associations of different work requirements, such as quantitative requirements ($r = -.27$), social conflicts ($r = -.26$), emotional requirements ($r = -.22$), working time ($r = -.17$) and role conflicts ($r = -.14$) with detachment. There is a small positive association with social support ($r = .17$) and a small positive association with latitude for initiative ($r = .05$) with regard to resources. As expected, the performance of work activities during the rest period was negatively associated with detachment ($r = -.28$; small to medium effect). No associations were found between the individual features of age and gender and detachment from work. However, small to medium negative associations with negative affectivity/neuroticism ($r = -.24$) as indicators of a habitually negative mood as well as with tendency towards excessive work ($r = -.32$) and job involvement ($r = -.30$) were found.

Outcomes – Moderator variables of associations

Q and I² statistics showed a high degree of heterogeneity for all association analyses, resulting in the assumption that moderator variables have an additional impact. For this reason, the moderating impact of study features (examination location, study design, year of publication), sample features (age and gender distribution) and the affective quality of detachment from work (valence) were reviewed. With a few inconsistent exceptions, no evidence was found for study features moderating the reported effects. Some albeit not always consistent evidence of moderating effects of the age and gender distribution of the samples as well as the valence of work-related thoughts was found for the associations with some stress load indicators. The strongest associations with work requirements were found for negative valence of thoughts about work. The examined moderators did not explain any additional variance regarding the association between the performance of work activities during the rest period and detachment from work. For the analysed personality traits, moderating effects of the gender share in the samples and of the valence of detachment from work were only found if negative affectivity/neuroticism was considered.

Impact of change in the working world

Against the background of the rather recent history of research on this subject (the first explicit study of detachment dates from 1998), it can be assumed that the subject is directly associated with change in the working world. For instance, increasing work intensity and an increase of emotional requirements (e.g. for service work, knowledge-based work and teamwork) as well as the dissolution of boundaries between work and private life (working

during the rest period, particularly using new information technologies) have been described as signs of change in the working world. Our analysis has highlighted exactly these factors as the strongest predictors of impaired mental recovery. It can therefore be assumed that the importance of the factor of detachment from work will increase in the context of ongoing change in the working world.

Design knowledge

Overall, there is only little verified design knowledge from interventional studies. Relational interventions to improve detachment from work were examined in only one reviewed study (without any effect). In five of six studies, behavioural interventions provided evidence that detachment can be trained (very heterogeneous effect sizes, reaching from “none” to “large”). Both the design recommendations from the studies and the results of our analyses indicate, however, that interventions for the optimisation of work requirements (work intensity, social conflicts, emotional requirements, working time, role conflicts) and work resources (particularly social support) would have to show protective effects, with the empirical verification of these assumptions still pending. Such a verification is also lacking for the beneficial effects, according to our results, of (1) the restriction of work activities during the rest period and (2) specific recovery activities (social, relaxing, not very demanding, physical activities). As key interventional approaches, the literature discusses work and organisational design beneficial to health and learning, organisational and personal measures for coping with high work requirements, organisational and personal measures for the promotion of recovery (and the ability to recover) as well as measures for the separation of work and private life, although little knowledge is available also in this context regarding the effectiveness of interventional studies.

Unresolved research questions

This article shows that detachment is both associated with various stress load consequences and impacted by different working condition factors. In many cases, however, these effects are influenced by the valence of detachment. Future studies should therefore focus more closely on the differential effect of the affective quality of detachment from work.

Against the background of a primarily subjective recording of indicators, there is a need for the extended utilisation of objectively obtained criteria (e.g. work performance, disease diagnoses) regarding the validation of the construct.

Building on the current Stressor Detachment Model (SDM; Sonnentag & Fritz, 2014) as well as expanding on the currently inconsistent findings of single studies, the assumed mediating function of detachment from work between working condition factors and stress load consequences should be studied. Methodically, this could be done by expanding our assessment strategy in the form of a meta-analytic path model. The moderating effect of individual processes of perception and assessment assumed in the extended SDM should also be the subject of future empirical research.

In addition, it needs to be clarified whether the reported associations also apply to regeneration mechanisms in shorter (e.g. rest breaks) and longer (e.g. weekend, holidays) phases of recovery. The importance of other work requirements for the detachment from work should also be studied, e.g. responsibility or completeness of working tasks.

Further conclusions

Our work confirms the important role of detachment as a potential link between working condition factors and stress load consequences. It further shows that the valence of work-related thoughts as well as structural (dissolution of boundaries between work and private life) and individual features additionally impact this association. In terms of an expansion of the theory on the effect mechanism of detachment from work, these factors should be tested in more complex models in the future. Our results also show that not only the existing work and organisational conditions, but also their later consequences during the rest period (recovery processes) as well as their feedback towards the next workday should be included to achieve a holistic assessment of work activities from a scientific perspective. For a holistic assessment of work, it should therefore be further studied and discussed whether detachment from work can serve as an indicator of unfavourable working conditions and stress load states.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-3c.html

Mobility

(Authors: A. Ducki & H. Nguyen)

Geographic mobility is a phenomenon characterising modern societies and potentially affecting all employees, which implies different forms and intensities of mobility and is associated with different risks and opportunities. A significant increase in mobile forms of work and new hybrid forms of mobility and immobility are linked to questions on the impact and design of mobility. How do people cope with frequent changes of location, what are the consequences for businesses, for families for health and well-being, for loyalty and dependence: “Where are we at home?” How does mobile work need to be designed in order not to impair the health of the involved persons?

Research question

This expert opinion reviews the state of scientific knowledge and insights on the associations of work-related geographic mobility and health. It illustrates the future need for research and systematically derives design recommendations. Indications are derived how to include the subject of geographic mobility in the debate by political actors and social partners in the context of mental health.

Fundamental theories

This expert opinion presents sociological and psychological models which can explain the complex interaction of different forms of mobility as well as private and professional framework conditions. Both loads and processes detrimental to health and the positive impact of mobility on health and well-being are considered in the process. Mobility models from stress and resource theory are described. In addition, theories on geographic socialisation and loyalty are discussed which can explain the social consequences of specific forms of mobility.

The expert opinion was based on the following “initial hypotheses”: Mobility can impact health both positively and negatively. The consequences differ depending on the specific life, work and mobility conditions as well as on the personal qualifications and can affect dimensions of physical, mental and social health to a varying extent depending on the form of mobility.

Method

The expert opinion is based on a literature search conducted in pertinent databases between February and May 2015, complemented by a manual search. In addition, contributions to an international conference on the subject “Internal Migration and Commuting in International Perspective”, held from 4 to 6 February 2015 in Wiesbaden, Germany, were included, as were results of the authors’ own research dating from the years 2001/2002. Brochures and publications by non-scientific institutions were reviewed for their relevance. A total of 156 sources, of which 54 were primary studies, have been identified as relevant sources and used as the basis of this expert opinion.

Outcomes

Mobility is a necessary component of everyday life. Individual biographies often include several mobility decisions. The mobility-related behaviour of employees is not only a response to professional mobility requirements, but often also the result of private and professional coordination processes, as well as of multiple intergenerational dependence relationships.

Job-associated and on-the-job forms of mobility can be distinguished. Job-associated mobility takes place before and after work and serves the purpose to coordinate professional and non-professional demands (e. g. commuting, relocation). On-the-job mobility is the result of mobility requirements of work itself (business trips, on-site work, secondment). Significant differences result from the point of view of the design of mobility conditions, as mobility takes place before and after the regular working time in the first case and is therefore primarily the responsibility of the individual or socio-political institutions. In the case of on-the-job mobility, the design of mobility conditions clearly is the responsibility of the employer.

In addition to personal, professional and private framework conditions, the intensity of mobility is relevant to health, which can be determined by travel time, the distances to cover and the frequency of travel. Across all forms of mobility, control aspects and, in this context, predictability and planning of mobility are primarily identified as health-protecting resources. In addition to traffic-related stress loads, such as traffic jams, delays or limited space in public transport, particularly high work intensity and time constraints (in the workplace, but also for certain forms of mobility at the weekend at home) as well as private and/or professional conflicts are stated as the most important stress loads relevant to mobility. Key resources are the voluntary character of the mobility-related decision, the intensity of mobility, predictability and options to influence the mobility conditions as well as the good functionality and individual fit of the applied technology.

Different requirements and loads, with different consequences for physical and psychosocial health, arise depending on the form of mobility. Increased traffic-related stress in the context of the daily commute is linked to numerous physical and psychosomatic symptoms displayed by the mobile person. For weekend commuters, separation from the family is associated with feelings of alienation and loneliness, as well as an increased risk of separation. In cases of secondment, the accompanying next of kin are in part more intensely affected by the consequences of the secondment than the seconded person himself/herself. In cases of on-site work, traffic-related and psychosocial stress loads aggregate and constitute multiple health risks, particularly under the condition of high work intensity and consolidation.

Many studies also report a positive impact of mobility on psychosocial health: Mobility can promote detachment processes, effectively benefiting recovery; the daily liberation from family-related duties enables many mobile employees to perform activities at the location of work they could not perform at home. This results in the opportunity to experience new things; feelings of freedom and autonomy, but also an increased sense of importance of the relationship with one's life partner are stated as further advantages of mobility. Seen against this background, professional mobility can itself constitute a stress factor or a resource, playing the role of moderator or mediator between family-related and professional requirements.

All aspects share that the subject of scheduling independence is of prominent importance, although any form of mobility can result in very different problems and requirements. The subject of intensification of work is closely associated with this. A key insight of this expert opinion is that excessive work intensity limits or even destroys the potentially positive impact of mobility on psychosocial health.

Assessment and discussion

The state of scientific knowledge is heterogeneous and widely differing in quality, depending on the form of mobility. A few reviews are available. Cross-sectional studies, mostly without, more rarely including a control group, as well as interview studies predominate. Longitudinal studies are rare and mostly consist of secondary analyses of population studies such as the SOEP (Socio-Economic Panel) or only involve a small number of cases. Only few, mostly newer studies have examined the complex interaction between family situation, working conditions and consequences of mobility for health. A systematic analysis of interaction effects is comparatively rare, however. Despite the heterogeneous state of findings, it can be retained that professional geographic mobility represents an important influencing factor for the health of employees which can have both positive and negative effects via widely varying mechanisms. An isolated analysis of the impact of mobility on health without any consideration of the specific life and working conditions, however, is almost impossible and would not make much sense either.

Future research questions

A statistically verified analysis of the interaction of professional, family-related and personal requirements and prerequisites is a key challenge for the further study of the association between mobility and health. Consistent recording standards should be of primary concern in order to ensure better comparability of the results across several studies in the future, e. g. in the form of meta-analyses.

Future research needs to find answers to the questions how basic human needs of loyalty, closeness, and trust can be optimally realised under mobility conditions. The ongoing process of digitisation can certainly provide some support in this context; however, opportunities and limitations need to be assessed. How much physical presence is required in workplace and private settings? What are the opportunities and limitations of virtual communication and leadership? To what extent can e. g. new digital instruments, such as the “digital couch”, replace physical presence and face-to-face contact? For which workplace and social conditions will a so-called “imperative of presence” continue to exist also in the future?

In addition, future research needs to study how scheduling independence can be designed in a way that allows mobile employees to really benefit from the few advantages of mobility as a health resource.

Beyond these basic questions, more concepts for workplace and individual mobility management should be developed enabling employees across different phases of life to be mobile in a healthy manner. Workplace and individual mobility conditions should be coordinated. Additional protective mechanisms should be established which prevent precarious, unprotected and illegitimate forms of professional mobility.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-3d.html

The impact of work-related permanent availability on life-domain balance and health

(Authors: B. Pangert, N. Pauls & H. Schüpbach)

Broadly understood, work-related permanent availability describes the availability of workers for work-related issues, or the availability of work-related issues to workers, extending beyond the domain of work to other spheres of life. Outcomes of scientific studies on associations between work-related permanent availability, life-domain balance and employee health are reported and assumptions regarding the impact of work-related permanent availability are derived. A literature search found 42 articles reporting a total of 189 associations, of which about two thirds are significant.

It has been found that the use of smartphones or other communication technologies in the evening for the purposes of work, as well as the permeability of the boundary between the spheres of work and private life in general, are associated with an impairment of well-being and private life. With regard to impairments of well-being (exhaustion, stress, detachment from problems, recovery), small to medium effects are found, while small to large effects are found with regard to an impairment of private life (e. g. conflicts between the different spheres of life). Already the expectation that employees should be available for work-related issues outside of working time is associated with an impairment of private life.

Conclusion

Negative effects of work-related permanent availability on well-being and private life are found, while positive effects remain largely unclear due to the state of scientific knowledge. Consequently, work-related permanent availability should be assessed as a risk for health and life-domain balance. The significance of the associations depends on personal traits as well as on the work and life situation. Further research appears to be necessary in order to verify the cause-effect relationships.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/Gd76.html

Work-life balance (Author: A. Wöhrmann)

Background and research question

The subject of the compatibility of work and private life, or work-life balance, has received more and more attention in recent years. This is reflected both by a significant increase in publications in the field of research and by the political debate (e. g. Federal Ministry of Labour and Social Affairs, 2015). Particularly against the background of increased use of technology and the associated potential for permanent availability or dissolution of boundaries, the subject is increasingly discussed. In addition, there are many indications that employees are assigning more and more value to a good balance between work and private life.

The work-life balance is in most cases studied as a conflict between roles and their demands in various spheres of life. Another object of research is to study to what extent roles from different spheres of life can enrich each other, as well as satisfaction with one's work-life balance. Various theoretical approaches deal with the relationship between work and family or private life as two spheres of life, e. g. conflict theory (Greenhaus & Beutell, 1985) and enrichment theory (Rothbard, 2001). The theoretical models most of the current research on work-life balance is based on are the theory of resource conservation (Hobfoll, 1989), the job demand-resources model (Bakker & Demerouti, 2007; Demerouti, Bakker, Nachreiner & Schaufeli, 2001) and the effort-recovery model (Meijman & Mulder, 1998). According to these theories, the work-life balance play an important role with regard to employee health and motivation. Based on this, the following research questions are studied in the context of this review:

Research question 1: What is the impact of work-life balance on aspects of mental health?

It is also of immediate interest how the work-life balance can be influenced by the design of working conditions. In order to find starting points for relational and behavioural measures for the promotion of a good work-life balance, this review additionally intends to study the following question:

Research question 2: What is the impact of working conditions on work-life balance?

Method

To begin with, a systematic literature search in various databases was performed. Search strings were developed for this purpose which were used to search for the different combinations of words covering the variety of terms for the different manifestations of the constructs of work-life balance. The search was not limited with regard to the variables of health or working conditions. Following the exclusion of duplicates, the search yielded 6,470 publications, the abstract of which were screened. The literature search showed that a large number of meta-analyses has already been published on conflicts between work and private life, as well as on aspects of mental health and working conditions. In the present review, these studies were assessed with regard to the construct "conflict between work and private life" instead of primary studies, in the form of a meta-analysis of the second order. The findings of the various meta-analyses (approx. 170 effect sizes) were aggregated for this purpose in the context of meta-analytical calculations.

A different approach was chosen for satisfaction with work-life balance and the construct of mutual enrichment of work and private life. Following the screening of abstracts and subsequently of full texts, 49 articles on work-life balance and 97 articles on enrichment were included in the analyses. The results of the primary studies, which are important for the analysis of the associations between work-life balance (236 effect sizes) and mutual enrichment of work and private life (689 effect sizes) with health and working conditions, were likewise aggregated to sample-weighted mean effect sizes for the individual relevant associations wherever possible.

Outcomes

Mental health in a broader sense was classified into the subject areas of subjective well-being, mental symptoms, work-specific mental symptoms, health symptoms, attitude to work and organisation, as well as behaviour at work. For conflicts between work and private life, aggregated meta-analytic associations of low-to-average significance ($\bar{r} = |.03|$ to $|.40|$) with almost all studied aspects of mental health were found for both effective directions, i.e. for the effect of work on private life and also of private life on work. A higher level of conflict between work and private life is consequently associated with poorer mental health. The only exception is behaviour at work (performance, commitment), for which no association with conflict in the direction of an effect of work on private life was found. The strongest association ($\bar{r} = .40$) was found for work-specific mental symptoms (burn-out and associated aspects, work-related load and stress). The associations are always somewhat stronger for conflict in the direction of an effect of work on private life than in the opposite direction.

Predominantly associations of low-to-average significance ($\bar{r} = |.08|$ to $|.36|$) were found for both effective directions of enrichment between work and private life. A higher level of mutual enrichment between work and private life is consequently associated with better mental health. The only non-significant association is that of enrichment with the effective direction from work to private life and mental symptoms (e.g. anxiety). The mutual enrichment of work and private life in association with the attitude to work (e.g. job satisfaction, commitment) was studied most often ($\bar{r} = .36$ and $.19$, respectively). The effects in the primary studies are small to medium-sized and are almost always significant. The same applies to behaviour at work (work performance, $\bar{r} = .30$ and $.24$, respectively). For enrichment also, the studied associations are always somewhat stronger for the effect of work on private life than that of private life on work.

Aggregated associations of low-to-average significance ($\bar{r} = |.14|$ to $|.45|$) with the considered aspects of mental health were found for satisfaction with the work-life balance, or the feeling of work and private life being in balance. The strongest effect ($\bar{r} = -.45$) was found for mental symptoms which were also negatively associated with work-life balance in all identified primary studies.

In summary, it can be said that the three studied constructs of work-life balance are strongly associated with aspects of mental health. A better work-life balance, or less conflict and stronger mutual enrichment of work and private life, is associated with better mental health.

The working conditions studied in association with the constructs of work-life balance can be assigned to the subject areas of working task (and job role), work organisation and support.

The strongest aggregated associations with the working task were found for conflicts between work and private life – depending on the considered effective direction of the conflict, their significance should be assessed as low to average ($\bar{r} = .40$ and $.19$, respectively). The global association between conflict and support at work is only significant in the direction of an effect of work on private life, i.e. little support is associated with a strong experience of conflict ($\bar{r} = -.16$). In the area of work organisation (flexibility, working time requirements), there was also only an effect in the effective direction from work to private life, albeit assessed as small ($\bar{r} = -.20$).

Less clear associations with working conditions were found with regard to the mutual enrichment of work and private life. A small effect was found for support in both effective directions ($\bar{r} = .22$ and $.16$, respectively). Working conditions concerning the working task in a broader sense had a small effect on enrichment in the direction of an effect of work on private life. There were no effects for the other studied associations. However, the situation of associations within the categories of working task, work organisation and support was heterogeneous. While only insignificant effects regarding enrichment were found in the primary studies on workload, the associations with aspects of autonomy were mostly of low-to average significance. In the area of work organisation, there are very few significant associations between working time requirements and the mutual enrichment of work and private life, while the effects for aspects of working time flexibility were mostly significant and of small to medium size. Support by the organisation, superiors and colleagues is mostly significant and positively associated with the mutual enrichment of work and private life.

Working conditions are associated with satisfaction with regard to the work-life balance ($\bar{r} = |.20|$ to $|.37|$). The strongest association was found for support in the workplace, while the weakest association was found with regard to work organisation. In the primary studies, the effects vary significantly between the different aspects of work organisation (flexibility, working time requirements). Aspects of the working task show almost exclusively significant associations with satisfaction with the work-life balance. Resources (e.g. task complexity) are positively associated with the work-life balance, while requirements (e.g. time constraints) are negatively associated.

With regard to the role of individual features, it can be said that the significance of some studied associations appears to be dependent on individual factors, such as age, gender and living conditions. The situation is not consistent, however, and is limited to a few clear effects.

Discussion

The reliability of the findings of the analyses in the context of this literature review is dependent on the quality of the underlying studies. Overall, the methodical quality of the individual studies must be assessed as low to average, although a trend towards methodical improvement (longitudinal studies, diary studies, interventional studies) was found in more recent studies.

With regard to conflict between work and private life, aggregated measures from meta-analyses were predominantly used, the quality of which is again dependent on the underlying primary studies. Studies in this subject area are mostly of the cross-sectional type and are based on self-reporting as the only data source (cf. Shaffer, Joplin & Hsu, 2011). A trend

towards methodical improvement can be found, however. A meta-analysis of data from longitudinal studies on conflicts between work and private life and stress load (Nohe, Sonntag & Michel, 2015) included 33 longitudinal studies. This meta-analysis supports the findings of the cross-sectional analyses. Nonetheless, methodical distortions in terms of an overestimation of effect sizes in meta-analyses based on cross-sectional studies are not improbable. The measurement quality in terms of the reliability of the measurement instruments, almost exclusively consisting of several items, can be assessed as good. Large samples and the availability of many international studies are indicative of a good generalisability of the results.

More than 80% of the primary studies included in the calculations of mutual enrichment of work and private life feature a cross-sectional design, for which reason methodical distortions cannot be excluded. However, the measurement quality can be assessed as good, as the studies almost exclusively applied scales with good reliability for measurement. Compared with the studies on conflicts between work and private life, the number of published studies is not very large yet. Due to the mean sample size of over 500 persons and also due to the heterogeneity of the samples, however, the generalisability can be assessed as adequate.

Many of the studies on satisfaction with the work-life balance are secondary analyses of large data records with a mostly cross-sectional design and very large heterogeneous samples. In this case, relevant constructs are significantly more often measured with one item only. Compared with the studies published on conflicts between work and private life, the number of studies must be assessed as low. The generalisability can be assessed as adequate overall.

The analyses in this literature review show that the constructs of work-life balance are substantially associated with various aspects of mental health (subjective well-being, work-related mental symptoms, attitude to work and organisation, among other things). In most cases, the found associations of conflicts and enrichment with aspects of mental health are stronger in the direction of an effect of work on private life than in the opposite direction. Work-life balance accordingly represents an important starting point with regard to the maintenance of employee health. This results in an urgent need for the development of recommendations for a work design which is beneficial to a good work-life balance. According approaches and options result from the analyses of the association of working conditions and the constructs of work-life balance. An example for this is the reduction of work-related loads such as the workload, strengthening the influence of employees on working time design and an improvement of the support employees receive from their superiors. In summary, a holistic approach should be chosen which focusses on support provided by superiors and the organisation. This permits the control of other aspects, such as the design of the working task, and enabling the utilisation of compatibility-related measures without the expectation of negative consequences.

The effects, which were largely found on the basis of cross-sectional studies, should be validated by longitudinal studies featuring a good methodical design, including long follow-up intervals. Diary studies should be increasingly used to study cause-effect mechanisms and more short-term stress load consequences. In addition, only few interventional studies are available to date highlighting which design measures lead to an improved work-life balance of employees. Future research studies should therefore focus on isolated and combined measures for the design of working conditions beneficial to compatibility. For instance, the effect if individual measures and of holistic approaches could be studied and cost-benefit consider-

ations in businesses could be supported. The continuation and methodical improvement of the research in the field of work-life balance are indicated primarily because the latter plays an important role in the context of change in the working world in terms of increasing flexibilisation, digitisation and work intensity.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-3f.html

4 Subject area “Technical factors”

Noise

(Authors: A. Liebl & M. Kittel)

How is the working condition factor defined?

Definition of the working condition factor “noise” in accordance with DIN 1320: Acoustics – Terminology

Noise: unwanted acoustic waves; acoustic waves which can lead to disturbances, inconvenience, impairment or damage.

Which measurement methods and accuracy were applied?

Regarding measurement methods and accuracy, standardisation provides clear recommendations. For instance, DIN 45645-2: 2012-09 describes the determination of the rating level in several steps. These steps include the job analysis, the performance of measurement, the determination of the rating level, the determination of the measurement uncertainty and the comparison with limit values as well as the preparation of the measurement report. It may be questioned whether the rating level represents the right predictor variable for the effects of noise in general. The application of the standard would ensure highly reliable and comparable measurement results, however. This is a basic requirement for the study of cause-effect relationships. The application of guidelines and standards, however, usually presents significant challenges with regard to specialist skills in acoustics and technical equipment. The description of the methodical approach to acoustic measurement in many of the reviewed studies, on the other hand, is not very exact and does not comply with the requirements of the guidelines and standards. The question of accuracy in the measurement of the working condition factor “noise” cannot be assessed on the basis of the reviewed studies and represents a separate issue.

What is the state of knowledge on stress load consequences?

The association between speech intelligibility as a predictor variable and performance capability in terms of basic cognitive functions such as working memory capacity can be regarded as certain. It should be assumed that the error rate in the processing of working memory tasks increases with increasing speech intelligibility.

In the context of the empirical studies on the association between speech intelligibility and performance capability, the impact on mental well-being is also frequently examined. The term of mental well-being includes e. g. the perceived workload, perceived annoyance, acoustic comfort, perceived stress, fatigue, listening effort, alertness, aggressiveness, concentration, attention and arousal. It has been found that a reduction of speech intelligibility is also associated with an improvement of mental well-being. This particularly applies to simulated office work, which predominantly involves silent and concentrated work. If the primary task is characterised by communication, the effect pattern is inverted and high speech intelligibility is assessed as positive.

The association between level-oriented features and performance has been studied in various work contexts. Overall, level-oriented features do not appear to be decisive for impairment of performance, which should not lead to the incorrect conclusion, however, that level-oriented features can be arbitrarily high.

In hospitals, for instance, the impact of level-oriented features in the surgical theatre on the frequency of occurrence of (post-surgical) complications or mistakes made by the surgeons has been studied. A reduction as a consequence of measures for noise reduction has been found here. For workplaces in the industrial sector, a significant correlative association between level-oriented features and indicators of productivity (subjective assessment) could be shown.

Studies on the association between level-oriented features and the cardiovascular system have been conducted primarily in the form of field studies in an industrial context. In summary, a verifiable impact of noise in the workplace on the cardiovascular system could be shown. This impact manifests in an increase of the systolic and diastolic blood pressure levels, an increased prevalence of hypertension, changes to the properties of the vascular system, changes to the heart rate and ECG anomalies as well as an increased heart attack risk.

Studies on the impact of level-oriented features on physical well-being primarily consider physiological effects of stress (e.g. concentration of stress hormones in saliva, urine or blood, and muscular tension). The findings show a heterogeneous pattern.

The reviewed studies on the association between level-oriented dimensions and mental well-being examine, with regard to the outcome variables, the self-reported experience of stress, inconvenience reactions, fatigue, mood and the perceived workload. Sound pressure level and loudness are strong predictors of annoyance or inconvenience. The office context reveals the associations between assessed loudness and annoyance, but also differences in annoyance between office environments with different noise levels. Regarding the mental stress effects, the findings were inconsistent.

How do you assess the scientific evidence at this time?

There are signs that, despite the multitude of studies on the subject of noise in the workplace, no binding limit values can be derived as of now which would do justice equally to all work environments. Rather, the specific acoustic environmental conditions and needs for protection depending on the job need to be accounted for. On the one hand, the acoustic environmental conditions (type and degree of noise exposure) in office jobs differ from those in workplaces in the industrial sector, the healthcare sector, etc. On the other hand, the need for protection and the necessary requirements also differ depending on the activity.

Applicable guidelines, such as VDI 2058-3, already take into account this approach, as the guideline assesses noise immissions in the workplace in consideration of different activities (predominantly intellectual activity, simple or practised office work and comparable activities, other activities). The reliability of the specified limit values and particularly their specific effect relationship in their current form must be questioned, however. There are signs that the limit values, which are often based on engineering, are not directly associated whatsoever with the studies of the effects which are more medical or psychological in character.

What is the role of change in the working world, and is it sufficiently accounted for in the studies?

The change in the working world has received almost no consideration in the context of the reviewed literature.

What design knowledge is available?

With regard to the feature of speech intelligibility, a number of interventional studies is available demonstrating the effectiveness of manipulations of speech intelligibility regarding performance and mental well-being. The options for active control of speech intelligibility include typical measures of building and room acoustics, such as the utilisation of highly absorbent ceilings or specific furniture, e. g. partition walls, on the one hand, while also extending to a targeted increase of the background noise level, e. g. by means of sound masking, on the other hand. In addition, different commercially available office equipments were examined with regard to the range of STI achievable through their utilisation. On the one hand, this study once more highlights the association between STI and performance as well as mental well-being, while on the other hand pointing out that the options for control of the STI by common measures of building and room acoustics are rather limited. The targeted increase of a masking background noise level can also be used to impact the STI and therefore both performance and mental well-being. However, there are also clear limits to increasing the background noise level for the purposes of impacting the STI, as the background noise in a room cannot be arbitrarily increased as the masking signals themselves will be perceived as disturbing above a certain level. At the same time, study outcomes indicate that specific office designs (open-plan offices vs. individual offices) feature general advantages and disadvantages and that work in open-plan office environments is associated with a stronger exposure to noise.

A few studies conducted in hospitals are available reporting both successful and unsuccessful design measures, e. g. successful reduction of the noise level and a reduction of stress indicators in surgeons, as well as post-surgical complications due to behavioural and technical measures in surgical theatres. These measures range from the reduction of alarm volume to specific instructions on how to handle technical equipment, such as suction devices. In contrast, however, no level-reducing effect could be obtained by means of the feedback of noise exposure using noise dosimeters. Spatial organisation measures in the pharmaceutical department of a hospital also did not result in any successful level reduction.

Which key research questions remain unresolved?

A harmonisation of the study approaches is required in order to allow more reliable statements to be made. This means that either comparable operationalisations of the predictor and criterion variables must be established or methods must be developed in order to transfer these different variables into a comparable dimension. This particularly requires more interdisciplinary cooperation. Exposure to noise in the workplace and the effects of noise are often considered separately. It is striking that studies on noise exposure are often based on engineering, while studies of the effects focus more on medical and psychological issues.

For office jobs, the association between speech intelligibility and performance as well as mental being can be considered stressful. The description of workplace quality exclusively uses technical parameters for assessment. These technical assessment parameters should be put into a specific context for reference with predictor variables of noise effects, e. g. speech

intelligibility, in order to use this as a basis for the derivation of limit values or quality levels which have been shown to be relevant to perception or impact.

Repeatedly, an association between the subjectively perceived disturbance due to noise and outcomes such as increased sickness absence rates or an increased risk of cardiovascular diseases has been reported. It is not possible, however, to derive a planning parameter from subjectively perceived noise exposure; therefore, it is necessary to establish an association between subjectively perceived noise exposure and physical measurement parameters.

There are also indications that there is still a significant need for scientific research studies on the association between noise and mental load. The specific association between noise and mental health or stress has rarely been examined in the studies reviewed to date, although it stands to reason that noise is a stress factor. It has been verified that noise occupies cognitive resources, which can only be compensated for by increased effort in the best case. It can impact the arousal level and can even have a positive impact on vigilance in the short term, but will cause stronger exhaustion in the longer term. Noise causes disturbances and interruptions of work which are perceived as stressful. Noise with a speech component particularly impacts the regulation of privacy and therefore represents a potential stress factor in terms of crowding. However, these effects have not been systematically studied in a work environment. The references made are therefore rather argumentative in nature. It should also be noted that moderator variables or coping strategies are rarely considered. In addition, effect sizes have been reported only surprisingly rarely, although applicable publication guidelines demand this. These effect sizes are necessary for the performance of meta-analyses.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-4a.html

Lighting (Author: J. Krüger)

Lighting essentially has two effects which can directly or indirectly impact mental health. Light environments can have an indirect impact via visual perception (visual dynamics). In addition, non-visual effects of light (also called melanopic effects of light) can directly impact physiology and behaviour.

Definition of visual effects of light: The terms “light” and “lighting” are defined in the International Lighting Vocabulary by the International Commission on Illumination (CIE, 2011, 2013).

Measurement of visual effects of light: The measurement of the light-related properties of light sources and lighting for visual dynamics is described by photometric dimensions. Of these, luminous intensity is the only dimension of the International System of Units (SI) based on human perception (through weighting with the luminous efficiency curve).

Stress loads in the context of visual comfort: Through visual comfort and visual contact with the outside, lighting in the workplace can, via visual dynamics, indirectly impact mental factors, such as well-being and symptoms. Lighting can cause reduced effectiveness of intake, processing and implementation of visual information, which can in turn cause mental stress. In such a case, we speak of visual fatigue or visual discomfort. This state can be characterised by cerebral symptoms, eye conditions and visual symptoms.

Unresolved research questions in the context of visual comfort: Despite a long tradition of research, the search for reliable measures of visual fatigue is still affected by methodological problems. The causes of eye conditions are largely unknown. For this reason, there is a need for research on these traditional aspects of lighting.

Design knowledge on visual comfort: It can be retained that the prevention of eye conditions has been considered in the regulations for the planning and design of lighting in workplace contexts. Requirements and design knowledge can be summarised under the category of visual comfort. Although the regulations do not explicitly use the term “visual comfort”, features of lighting quality (e.g. flicker, psychological glare, shadows or uniformity) refer directly to visual comfort. The review can be used to assess that visual comfort plays a rather minor role with regard to mental health.

Stress loads in the context of visual contact: In contrast, there are some initial indications that daylight and visual contact with the outside can be associated with a positive impact on well-being. However, the state of scientific knowledge still requires verification (Aries et al., 2015). The positive effect of daylight is clearer in combination with visual contact with the outside. In addition, windows create a connection with the outside world, provide information on time of day, weather, seasonal changes and reduce/prevent feelings of constriction and claustrophobia. Windows can benefit ocular health by providing an option for focussing on far-away objects, thus counteracting temporary short-sightedness. For studies and insights on visual contact with the outside, it must be noted that the indirect effects of visual contact cannot be separated from the direct effects of daylight (non-visual dynamics). Insights on the non-visual effects (e.g. synchronisation and stabilisation of the internal clock by daylight) show close associations with mental health and are equally relevant for the feature of visual contact.

Design knowledge on visual contact: The importance of daylight and visual contact with the outside for safety, health and the well-being of employees is reflected by the current draft of the Workplace Ordinance (Ordinance to Amend Occupational Safety Ordinances, Article 1, Amendment of the Workplace Ordinance of 29 October 2014) as well as by the standards on daylight. The design knowledge primarily refers to the arrangement and size of the glass surfaces, as well as to sun protection and anti-dazzle devices.

Need for research on visual contact: Non-visual aspects, such as synchronisation and stabilisation of the internal clock, have not been considered so far in the regulations or in design knowledge. The combined effect of view and daylight has rarely been studied. There is therefore an increased need for research here.

Definition of non-visual effects of light: In addition to the visual effects on mental health, recent studies in the fields of medicine and biology have shown that lighting has an impact on the internal clock and the associated circadian rhythms. A direct impact on physiology and behaviour results from the definition of the non-visual effects of light (also called melanopic effects of light) in DIN SPEC 5031-100 (DIN SPEC 5031-100:2011, 2011).

Stress loads in the context of non-visual effects of light: For non-visual dynamics, the acute impact on the cardiovascular system and performance must be separated from the medium-term impact on the circadian system (synchronisation, desynchronisation).

With regard to the acute effects of lighting, a large number of studies confirms the activating effect of bright light and a larger share of blue light. The activating effect refers to cognitive effects of attention, executive function and memory capacity. These insights are supported by studies in neuroimaging, which have shown that cerebral responses change depending on wavelength and light intensity (Vandewalle et al., 2009). Overall, the studies permit the conclusion that the increased activation associated with intense lighting as well as a reduced impact on attention do not only increase visual performance, but work performance in general. Similarly acute effects of light exposure are found in the effect on the cardiovascular system. In addition to the impact of light on cortisol levels, effects on heart rate, blood pressure and heart rate variability have been documented.

In the long and medium term, lighting conditions can impact the circadian rhythm, well-being and mental disorders. Medical studies on light therapy have established an association between light and mental disorders. There is a general consensus on the effectiveness of light therapy for the treatment of seasonal and non-seasonal depressive symptoms. The review references studies from the field of medicine, as a critical significance for non-clinical populations and the lighting of workplaces can be derived from the insights.

For the impact of lighting on the circadian rhythm, it can be retained that the timing of sleep is partly determined by the individual exposure to light. A positive trend has also been found with regard to the association between light exposure during daylight hours and the quality of sleep or time required to fall asleep. Conversely, light exposure with a higher share of blue light in the evening and at night is associated with worse sleep and disturbance of the internal clock.

It has been found that, depending on the time of exposure, lighting can trigger an adaptation (synchronisation) or disturbance of the circadian physiology. For synchronisation, lighting in the morning hours plays a more important role than light in the midday hours. The studies included in the review indicate that persons who get a higher daily dose of light display higher vitality levels, whereas lower lighting levels tend to be associated with chronic fatigue.

For all studies of non-visual dynamics, it can be stated in general that the following disturbance variables need to be documented for a transparent interpretation of the effects of light: Type of light exposure, light history (photic history), individual circadian phase, level of sleep deprivation, type of working task, and age. So far, the differences in the considered studies concerning the stated disturbance variables do not permit a final statement on the effect of light on mental health.

Need for research on non-visual effects of light: A need for research results particularly with regard to the importance of biological darkness and lack of light for mental health and performance.

Measurement of non-visual effects of light: Several methods and assessment functions are available for the measurement of biologically effective light (Brainard & Hanifin, 2014). New insights and an increasing understanding of the effects have shown that the currently applied methods are incomplete. So far, it has not been possible to estimate the potential effect of lighting with known intensity and spectral composition (Lucas et al., 2014).

Design knowledge on non-visual effects of light: Despite the uncertainty of the currently available measurement methods, fundamental design recommendations can be derived. It is considered verified knowledge that light with shorter wavelengths constitutes a more intense stimulus of non-visual dynamics. With regard to the non-visual effects, it has been found that, in principle, all lighting triggers a biological effect and impacts mental factors. In addition, it should be stated that all workplaces and all employees are affected by the non-visual effects of light. Workplace lighting can trigger both positive and negative effects for mental health. These effects can even occur simultaneously. An example for this is bright light at night, which has an activating effect, but simultaneously disturbs the internal clock (desynchronisation).

Stress loads in the context of individual controllability: Also worth mentioning is individual controllability, which concerns both the visual and the non-visual effects of light. Individual controllability can be considered more of a secondary resource of latitude for initiative and decision-making, with individually controllable lighting generally being preferred to lighting conditions controlled by third parties.

Conclusions: A general outcome of the scoping review is that particularly the non-visual effects of lighting in the workplace context have not been considered so far as factors of mental health, although they can directly impact physiology and behaviour.

For the complete review see
www.baua.de/de/Publikationen/Fachbeitraege/F2353-4b.html

Climate

(Authors: K. Bux & C. Polte)

Definition of thermal room climate

The thermal room climate is defined by interaction of the four climate factors of temperature, humidity and air velocity, as well as thermal radiation. It significantly impacts health, well-being, motivation and employee performance. Particularly dissatisfaction with the room climate (too hot, too cold), reduced performance due to low/high temperatures, stress due to the lack of options to control the room climate, as well as the consequences of certain climate phenomena (e. g. skin irritation as a consequence of dry room air) can indirectly trigger mental stress even in moderate room climate (e. g. in the office). In cold or warm/hot room climates due to technological requirements, stress responses and an impact on performance as a consequence of the high thermal load can be observed in addition to the mechanisms of thermal regulation (e. g. sweating) and disorders caused by cold/hot conditions (e. g. hypothermia/heat exhaustion).

Measurement of thermal room climate

For the measurement of the current state of the room climate, a sophisticated range of technical measurement methods and instruments is available, which can be used to determine the exact state of the room climate provided that the applicable knowledge has been obtained. In addition, the room climate resulting from heating, ventilation, air conditioning, building condition, etc. can be calculated in advance with sufficient precision on the basis of simulation calculations. Valid measurement methods and instruments, as well as calculation models, are also available for the determination or forecast of physiological reactions of humans to thermal loads (e. g. sweat rate, change of core body temperature). The mentally based responses of employees to the room climate (e. g. thermal perception, satisfaction, commitment, motivation) can be recorded using standardised interview methods (Likert scales). Various instruments often developed by the researchers themselves (e. g. recording of speed/precision of writing/calculating, response to signals, etc.) are used to determine the objective performance.

Stress load in the context of agreeable thermal room climate

Unless technological constraints require a cold or hot climate, a thermally agreeable room climate is intended in the workplace, particularly in offices and similar environments. This climatic state, also called “thermal agreeability”, exists when people experience air temperature, humidity, air velocity and thermal radiation as optimal and do not want it to be warmer or colder. In terms of physiology, this is the state in which the organism requires a minimum of thermal regulation to keep the core body temperature constant. A sustainable positive impact on health, work performance and well-being of employees can be reached with a room climate adapted to human needs. Accordingly dimensioned heating in winter or air conditioning in the summer, as well as ventilation, are needed for optimal regulation of the room climate in conformity with the generally accepted rules of technology. Valid design knowledge based on an extensive body of standards is available for this purpose. Nonetheless, experience has shown that it is impossible to comply with the needs of all users. Different people will often perceive one and the same climate as too warm or too cold and will complain e. g. about draught, cold floors, dry air or too intense thermal radiation of heating surfaces (dissatisfaction with the room climate). This is due to the fact that the association between temperature stimuli and the varying individual assessment, as well as the resulting personal

experience of the room climate, plays an important role in addition to the purely physiological effects of the climate (thermal regulation, hyperthermia, hypothermia). It is known in climate research that, particularly in a thermally agreeable room climate (comfort), the perception/assessment depends not only on physical/physiological marginal conditions (climate factors, clothing work intensity), but also on psychological components, such as expectations, experience, one's own prejudice or that of others, or process of group dynamics. This additionally causes a large individual variation in the assessment or perception of the climate. The following effects are closely associated with these mechanisms and are meaningful for the working world:

- A complex problem, which also has an impact on employee health, occurs particularly in office employees during the heating season: complaints about burning eyes, dry mucous membranes or itchy skin. The cause for this is considered to be the low relative humidity prevailing in interior spaces during this season due to the outdoor climate. In addition to the physiological effects, this can be indirectly associated with a mental load (complaints about dry air). The causes appear to be multifactorial in nature and are controversially debated by experts.
- In workplaces without any technological constraints (e.g. offices), thermal agreeability is regulated according to the state of the art (heating, air conditioning). Nonetheless, not all interests can be served in practice; the same room climate is perceived differently by different users. Complaints, e.g. about draught, cold floors or asymmetric thermal radiation of heating surfaces negatively impact well-being.
- Even an optimally adjusted room climate can become problematic. For instance, an unchanged climate over a longer period (lack of stimuli, monotony of climate) or the perception of being unable to influence the room climate in the workplace (“perceived control options”) have a negative impact on people and lead to complaints and dissatisfaction, and therefore to reduced motivation and job satisfaction. This results in an increasing, conscious feeling of discomfort. It can increase from a simple inconvenience to agonising perception, thus acting as a temporary or even permanent stress factor. Mental disorders can ultimately arise by indirect means.
- Another effect particularly arises in case of rising or also falling room temperatures (overheated rooms or rooms with reduced temperature). Attention, concentration and ultimately commitment will decrease. The increased effort to achieve the required performance, an often subjectively perceived performance decrease, as well as dissatisfaction with more frequent errors ultimately result in stress reactions (decrease of performance).

Stress load in the context of room climate with climatic stress factors (work under hot/cold conditions)

Work under stressful climatic conditions (work under hot/cold conditions) leads to thermal stress (hyper-/hypothermia) and can generally lead to mental strain like dissatisfaction or stress, in addition to acute or chronic physical illnesses, particularly due to the arising secondary illnesses (e.g. common cold), which are associated with the climatic stress at work by the employee. Based on workplace experience, however, the physiological consequences of high thermal stress load for health in case of heat (e.g. heat exhaustion, heat cramps, heat stroke) or cold (e.g. acute: hypothermia, local frostbite; chronic: rheumatoid arthritis, respiratory tract diseases), while mental problems play only a minor role. There is an indication that cognitive performance is altered.

Stress load in the context of warm room climate

Closely associated with the domain of thermal agreeability (comfort, no or only minor thermal stress load), the sweat rate significantly increases in high temperatures, the heart rate slowly increases, but the core body temperature only increases slightly or initially remains at a slightly increased level. This is the so-called “acceptable range”, in which the surrounding climate has only a minor impact on the core body temperature and the organism consequently still exhibits homiothermic behaviour. At the upper end of this range, the sweat rate almost reaches a maximum, the core body temperature cannot be kept constant permanently and will increase over time with increasing climatic stress. This corresponds to work under hot conditions which can be performed only for a limited time and under protective measures. Heat exhaustion, heat cramps, heat exhaustion due to salt loss (salt deficiency), heat exhaustion due to dehydration, conventional heat stroke as well as stress-related heat stroke are typical illnesses caused by heat.

Stress load in the context of cold room climate

In a cold climate, a negative energy balance can occur in humans, i.e. the core body temperature decreases. In addition to air temperature, the work intensity (metabolic heat production), clothing, air velocity and duration of stay (work under cold conditions) are decisive for the stress load under exposure to cold. Draught leads to significantly increased cooling, particularly on unprotected skin areas. Even when the thermal balance of the entire body is acceptable, unprotected skin areas (e.g. ears, nose, chin) and the extremities (fingers, toes), which receive less blood flow under cold conditions, can be at risk and damage to health (local frostbite) is possible. Consequences in case of longer – even moderate – exposure to cold, such as loss of mobility, reduced dexterity and lower sensitivity are found or discussed. There are indications of increased occurrence of respiratory tract diseases, rheumatoid diseases, and complicated healing of other illnesses, although no epidemiological evidence is available.

Change in the working world

The change in the working world also implies a significant change with regard to aspects of room climate in the workplace. Traditional climate problems (particularly work under hot conditions) become less prominent as a consequence of increasing automation and the decline of certain industries (e.g. steel mills, coal mining). In contrast, negative consequences in association with the complex operation of air-conditioned buildings occur more frequently (e.g. symptoms, “perceived control options”) or summertime overheating due to large glass surfaces on building façades (reduced performance). Although no direct functional chains between climatic stress loads and mental health could be derived so far, indirect mental

stress due to e. g. discomfort, dissatisfaction, annoyance because of the climate or the lack of control options can be found against this background. Complaints or grievances are also sometimes targeted at the climate in terms of a “surrogate function”, although other problems are negatively impacting mental health.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-4c.html

Human-machine interaction (Author: S. Robelski)

Definition of the working condition factor

In the context of the project “Mental health in the working world – Determining the current state of scientific evidence”, it is necessary, to begin with, to define the working condition factors. Human-machine interaction (HMI) is a consequence of increasing automation. In automation, machines and automated systems (computer-controlled machines) assume functions which were previously executed by human beings. The scope of functions performed by machines and automated systems is large; besides executing actions, they can also take over functions of human information processing. Generally, the interaction of humans and machines is characterised by the human part of the system lining out tasks, objectives and existing constraints to the technical part and subsequently controlling the machine or the automated system (definition of start and stop, modification of task execution). Examples for the results of the interaction are information, products or energy.

To reach the set objectives, it is important to define an appropriate function allocation between humans and machines as well as to design the interfaces (input and output devices), as they jointly determine the mental and physical requirements for the operator.

Measurement of the working condition factor

Human-machine interaction is measured in various ways, from objectively verifiable and variable system characteristics and the registration of natural conditions to the use of psychometric instruments, such as questionnaires. In addition, major differences can be found in the scope of characterisation of HMI.

A definition of the independent variables (IV) on the basis of objective criteria (144 individual measurements) can be found particularly in the field of function allocation, which often considers the interaction of humans with an automated system. Studies can be found, for instance, in which the degree and the level of automation are varied. Additional system characteristics, such as reliability, can be described objectively and numerically using event frequencies, error and failure rates. Particularly in experimental interventional studies, the variation of these conditions is realised through the use of simulation programs, in which different work environments (e. g. process control) are simulated. Clearly defined criteria and delimitable characteristics can also be used for the experimental study of interfaces. Examples for this are the technical variation of the display medium (e. g. tablet PC or head-mounted displays [HMDs]) and the form of display. Studies conducted in the field, in most cases, make use of descriptive characteristics in order to assign the existing machines and systems to different groups and to highlight the upcoming human-machine interaction (34 individual measurements). An example for this is the subdivision of production systems based on technological progress and changes to working tasks as manual, semi-automated and highly automated. Only few studies have focussed on the operationalisation of specific aspects of human-machine interaction. Psychometric measurement instruments which register aspects such as the degree of technological interconnection, technological abstraction or technological uncertainty are often used to do so. There are only few publications among the extracted studies including self-reporting by users (31 individual measurements) or assessment of characteristics by another person (7 individual measurements). The applied instruments are predominantly not standardised, so that statements on their quality criteria are difficult.

Some studies only report the internal consistency reached by the scales in the context of the respective studies.

State of knowledge on stress load and stress load consequences

The extraction of the verified insights on stress load and stress load consequences in the scoping review follows a subdivision of the working condition factor HMI into the three characteristics of function allocation, interface design and operation. Overall, the state of scientific knowledge obtained in the context of the scoping review does not allow any statements on the association between function allocation and mental health characteristics. It can be derived from the studies, however, that the degree of automation (DOA) and the level of automation (LOA) as well as the manner of LOA assignment (static or adaptive) have an impact on the stress load of the operators. An increasing degree of automation and higher levels of automation can reduce the subjective stress load. No long-term stress load consequences can be derived on the basis of the current state of scientific knowledge. The extracted studies do not allow any statements on the association between function allocation in complex systems and job satisfaction or motivation. With regard to performance, advantages of a high degree of automation can be found in routine situations, but these rarely also apply to exceptional situations. The manner of LOA assignment and the ultimate level of automation occasionally impact performance parameters, albeit without a clearly discernible pattern. The studies also indicate that the selected principle of function allocation as a stress factor (e. g. limitation of autonomy) or as a resource (e. g. capacity extension) can change the latitude for initiative and decision-making of the operators. The latitude for initiative and decision-making therefore represents a link between the working condition factor HMI and mental health.

The available insights on the benefits of ergonomic design can be confirmed for the characteristic of interface design. Particularly the functional and redundant display of information and the application of design principles are associated with increased user satisfaction and performance benefits. Work with modern technologies, such as HMDs, can cause physical symptoms in the short term. Verifiable statements on long-term stress load consequences or on the impact of interface design on job satisfaction and motivation cannot be made in the context of the scoping review.

In the area of machine and systems operation, a negative impact on mental health and intrinsic job satisfaction can be found for the close interconnection with technology. Effects for the association between the properties of a system (e. g. system reliability) and the performance as well as the confidence assessment of operators can also be found. More reliable systems are associated with higher performance and strong confidence in the system. Aspects of operation can also have an impact on other features of the working task and of work organisation (e. g. time and method control), albeit with predominantly small effect sizes.

Design knowledge

The gained insights on the association between the working condition factor HMI and the dependent variables should be reflected in the derivation of specific design knowledge. Overall, the benefits of ergonomic design can be confirmed. This applies both to the design of technical aids and to the design of interfaces. The redundant display of information, the application of design principles and the qualitative integration of information are only some aspects which can play a role in this context. The available standards and regulations also make available many tried and tested design principles (e. g. DIN EN ISO 9241).

Following the approach by Ulich, the working task links the human system and the technical system (Ulich, 2005). It is therefore important to take into account the requirements of the task also for the design of the HMI. An additional focus should be on the fit between the human system and the technical system. This can be done by involving future users in the technological development process. Detailed knowledge of the range of functions and the properties of systems can also contribute to successful HMI. In complex systems, it is difficult to derive design recommendations, as there are numerous cause-effect relationships between the manner of technical implementation and user-oriented outcomes. For highly automated systems, it can be generally advisable to grant users access to raw data and to keep them “in the loop” with different activities.

Association with change in the working world

A significant issue considered in the context of the scoping review is the change in the working world. It has been found that this change is reflected in the studies on the working condition factor HMI. New technologies, such as robots, data goggles and augmented-reality systems are studied with regard to their impact on health and performance. An evolution of the focus of research can also be observed in the context of technological progress and ongoing automation. While studies from the 1980s frequently address aspects of computer-integrated production and the introduction of computer-controlled machine tools, more recent studies focus more on the impact of function allocation in complex automated systems.

Demographic change is another aspect of change in the working world. However, age-related aspects play only a minor role in the majority of extracted studies. This is true both for potential differences between older and younger employees and for the age-appropriate design of technical aids.

Need for research

Despite an extensive literature review, numerous questions remain unresolved, from which new research questions can be derived. For instance, the scoping review highlighted a clear focus in the context of experimental interventional studies and student samples with regard to both the applied research designs and the studied samples. It is therefore necessary, to begin with, to increasingly verify the available knowledge from experimental studies in the field and to cooperate with workers in the process.

There is also a need for additional research on the question whether existing interface and interaction concepts can also be transferred to work with new technologies or whether new forms of cooperation need to be found. It should also be reviewed which working tasks are actually suited for the utilisation of new technologies. The technology-centred perspective and the orientation towards technological aspects of the human-machine system, which is also reflected in the Industry 4.0 approach, should be replaced with a more holistic view. The latter emphasises the interaction between humans and machines in one working system and contributes to the development of integrated HMI concepts.

The study of the extensive interaction between the manner of function allocation and the dependent variables, as well as among the various dependent variables, represents another starting point for future research work. It seems that particularly the association between the desire for control activities, confidence in systems, stress load and performance has not been sufficiently elucidated by the available studies. Design approaches which are as specific as

possible, contributing to demanding and beneficial HMI in this subject area with conflicting priorities, can only be derived if the manner and the scope of interaction are known.

Further research is also required with regard to how aspects of human-machine interaction impact mental health and job satisfaction. The scoping review has highlighted a significant research gap particularly for these two subject areas.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-4d.html

Human-computer interaction

(Authors: K. Höhn, A. Jandová, S. Paritschkow & M. Schmauder)

The review of human-computer interaction at the office (working condition factor) included a search for and the assessment of studies on software (characteristic A) as well as on input and output devices (characteristic B). The central research question was: What is the impact of the design of human-computer interaction at the office, in consideration of age and gender, on mental health, well-being, motivation and job satisfaction as well as performance?

The design of human-computer interaction (HCI) at the office is concerned with the user-oriented design of interactive systems and their human-machine interfaces at the office. Ergonomics and usability of software and hardware are two important aspects of human-computer interaction at the office. Accordingly, studies on design aspects of software as well as of input and output devices, including hand/armrests, were examined in an office context (e.g. administration, architecture firms, data input, front desks in hotels, call centres). On the other hand, studies on production and monitoring activities, virtual reality, e-learning, computer training or web design, application of software for medical diagnosis, of computers for fundamental scientific research (e.g. on spatial perception) as well as of computer-based programs for health promotion (e.g. automatic reminders of rest breaks) were not examined. Methodological studies (e.g. comparison of different methods for the measurement of computer working time) as well as studies focussing on work organisation and workplace design were also not included in the review.

The approx. 51,000 titles on the subject researched in the databases PubMed and EBSCO underwent a gradual, criteria-based exclusion process, which ultimately yielded 63 reviewed full texts and five titles researched by means of a manual search.

Of the 68 assessed studies, 59 had taken place in a laboratory environment, followed by eight field studies and one meta-analysis. The study populations were predominantly age-homogeneous student random samples (N = 26 studies); 18 studies used workers as test subjects. 17 studies did not provide any sample characteristics. Most studies were small in scale: 39 studies involved no more than 40 test subjects; another 20 studies included a sample consisting of between 41 and a maximum of 100 persons. The operationalisation of the outcomes was handled in very different ways. Quantity and quality of performance were recorded objectively, mostly by time and number (of performed tasks or errors made). The understanding of well-being and motivation/job satisfaction varied widely between studies. In most cases, subjective measurement methods were applied, with approx. 50% of cases recurring to already tested scales (e.g. NASA Task Load Index).

For characteristic A – software, the assessed 43 studies considered dialogue design, information display, dialogue and user prompting, as well as their association with mental health, well-being, motivation/job satisfaction and performance.

Generally, very few studies were found for both information display and dialogue prompting. Only few aspects of information display play a role here. The same is true for dialogue prompting. More data are available for user prompting and dialogue design. For user prompting, most studies were conducted on feedback, while studies on error management

and online help were also found. A majority of studies focussed on the association with performance, while only a very small number was concerned with mental health.

For characteristic B – input and output devices, the assessed 25 studies considered the design of the physical input devices, displays and speech dialogue systems, as well as their association with mental health, well-being, motivation/job satisfaction and performance.

The largest number of studies could be found for the association between input/output systems and performance. Eleven studies on input devices and two studies on displays could be researched for the outcome of motivation/job satisfaction. Six studies are available for speech dialogue systems. No studies were found addressing mental health.

For the physical input systems, different types of input devices (e. g. keyboard vs. mouse, trackball vs. mouse, etc.) or different versions of them (different types of keyboard, different types of mouse, etc.) were usually compared. The studied outcome aspects mostly referred to fatigue, discomfort and user convenience. There is only a small number of studies or insights on mice. The number of studies on trackballs is also very small. Likewise, only one study on tablets was found.

Six studies on displays and seven studies on speech dialogue systems were researched and assessed. In addition to the associations with performance, well-being and job satisfaction were studied in them.

For the assessed studies, one description each of the associations between the aspects of software design or the types of input/output device and their associations with the outcomes were performed, followed by an assessment.

Design recommendations were extracted from the 68 assessed studies on software and input/output devices. For software design, however, the design recommendations merely refer to the studied and therefore often isolated aspects like feedback, menu design or error management. For input and output devices, the design recommendations on the one hand refer to the design of the devices themselves (e. g. of keyboards or pens), but also on their suitability for the fulfilment of working tasks at the computer (e. g. for data input) on the other hand. Speech dialogue systems are recommended as supplementary systems.

Verified design knowledge is, however, limited to individual subfeatures of the design of software or of the input and output devices. The design information confirms the existing recommendations in the known guidelines (DIN EN ISO 9241, DGUV Information 215-410), partly exceeding them (due to the speed of technological progress). They permit the assumption that observing this design information leads to better well-being, higher motivation, job satisfaction and better performance.

Overall, it can be stated that there is only a relatively small number of studies on the association between human-computer interaction at the office and mental health, well-being, motivation/job satisfaction as well as performance (= the focussed outcomes). The research results so far primarily refer to sub-aspects of the design of human-computer interaction at the office, often only in association with performance. Performance was operationalised in many

different ways and verified under laboratory conditions using widely differing (small-scale) tasks at the computer, so that no general statements are possible even for this outcome.

Age and gender as moderating variables played only a minor role or no role at all so far.

Generally, there are indications that “good” design of software and hardware at the office can contribute to improved well-being, motivation/job satisfaction and performance. This remains unclear so far for mental health. There are also no insights on stress loads (excessive or too little demand due to the design of HCI at the office) or potential stress load consequences (e. g. monotony, fatigue, saturation, stress). More field studies would have to be performed in order to gain such insights. Most of the researched studies were laboratory studies, however, which do not permit any conclusions on short-term and long-term stress loads or stress load consequences. The few existing field studies also did not examine stress loads and stress load consequences.

It must be taken into account in this context that not only the moderating variables of age and gender, but also other variables, such as organisation, corporate culture or the experienced meaningfulness of work have a large impact on mental health, well-being, motivation/job satisfaction as well as performance.

Accordingly designed longitudinal field studies with a solid data basis are lacking. The current design options for human-computer interaction, current office trends, younger user groups as well as new forms of work should be considered.

The past focus on laboratory studies also did not allow research questions resulting from change in the working world to be sufficiently considered.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-4e.html

5 Subject area or cross-sectional topic “Design approaches”

Organisational resilience

(Authors: M. Hartwig, B. Grauel, B. Lafrenz & A. Barth)

Research question and definition

The term “organisational resilience” is an umbrella term for different design principles at the organisational level. The basic idea is that there are designable structures and processes at the level of work organisation which contribute to resilience towards a dynamic environment. To be “resilient” means to uphold functionality with regard to certain outcomes or to restore it as quickly as possible following a disturbance. In scientific literature, the term is discussed not only with a single system outcome in mind, but different outcomes such as safety or productivity. This openness of the concept results in the possibility of establishing connections with the debate on the design of work which is beneficial to mental health. Within the scope of this article, organisational resilience should therefore not be seen as a working condition factor, but as a current requirement for work organisation to function as an organisation even under dynamic environmental conditions.

There is no consistent definition or concept of organisational resilience in scientific literature, however. In addition, there are only few approaches to enable an objective measurement of resilience. The objective of an exploratory literature analysis on the subject is therefore to start with a comprehensive clarification of the construct in association with the design of work organisation.

Methods

To ensure a holistic overview of the concept of organisational resilience, various aspects of resilience are processed applying different methods and are correlated with each other. Additionally, areas are identified which are motivated by the basic idea outlined above, therefore semantically corresponding to the concept of organisational resilience as understood by the BAuA, although they do not necessarily use the term “organisational resilience”.

A classification of the term has been derived from the analysis of different definitions of resilience, as well as a content-based split into two subject areas discussing organisational resilience. The first subject area is so-called “resilience engineering”, which strives for safe work organisation under fluctuating conditions, while the second subject area is concerned with “holistic production systems”, with a primary focus on cost-effectiveness. Another important impulse for the concept of organisational resilience originates from the sociologically determined debate on organisational uncertainty. It has also been found that there is not much literature available studying the impact of these methods on mental health. For this reason, the present article establishes a link with humane work by generating hypotheses on how the discussed methods can affect the working condition factors of the project “Mental health in the working world”. The result is an overview of which measures of work design promoting resilience can potentially impact mental health.

Outcomes regarding the approach

The phase model of measures promoting resilience is the result of the definition assessments. Upon consideration of the different definitions, it was found that similar terms occur repeatedly across the different sectors as well as across the different intended outcomes. The terms for measures and designs were then extracted from this set of definitions and redundant terms were combined in order to obtain definitions of what is characteristic of resilience or what causes it. The terms can be classified according to the point in time in relation to the occurrence of the fluctuation/disturbance.

“Anticipation”, as the first measure in chronological order, describes the anticipation of a potential disturbance. “Buffering” refers to the attenuation of the effects of a disturbance before the latter becomes full-fledged. “Coping”/“adaptation” consists of the handling of an acute effect of a disturbance. “Recovery” means re-establishing functionality following its impairment. Finally, the term “learn” describes the adaptation of organisations after the effects of a disturbance have subsided.

Consequently, the model defines the limits of the concept of organisational resilience, while also providing a framework for the systematic classification of a wide variety of measures promoting resilience, independent of the desired outcome.

Outcomes for subject area “resilience engineering”

In the first identified (partial) subject area “resilience engineering”, all definitions share the objective of insurance against the loss of control in unexpected situations.

The discussion on which indicators represent the resilience of an enterprise is still ongoing. Among the discussed factors are the supporting requirements of the top management including supporting interaction mechanisms, the provision of adequate resources including latitude for initiative, as well as a process of continuous improvement.

On the basis of theoretical considerations and studies of accidents, new analysis methods have been developed which illustrate the dynamic interaction of work teams within companies and within a network of organisations in order to discover weak points in the system, to develop measures to compensate for disturbances and to create resources for unexpected situations. Cognitive task analysis is additionally applied to study companies and networks with regard to their degree of resilience using the stated indicators. Statistical assessments of the measurement results are rather an exception. The assessment was not compared with a control group, but different companies were compared with regard to their organisational structures. No laboratory experiments under predefined framework conditions were conducted.

Following the introduction of the measures to promote resilience, an in-part performance increase in the processing of tasks could be observed. The impact on mental health has not been studied. Rather, options to increase efficiency and prevent errors in workflows were determined in order to save resources and to create latitude for initiative in case of disturbances.

The approach of “resilience engineering” is a consequence of change in the working world due to an increased interconnection of organisations. This interconnection leads to dynamic

environmental impacts with an influence on the workflow of companies in cooperation with other organisations. Serious accidents in high-reliability sectors and in the high-risk industries have shown, that unexpected situations lead to a loss of control and the past understanding of safety is no longer sufficient to avert danger in such cases.

Empirical field studies have resulted in design recommendations. There is only little evidence of the effectiveness of these measures, however. Various design recommendations discussed in the literature directly refer to the working condition factors or the project “Mental health in the working world”, such as healthy leadership, latitude for initiative and decision-making, as well as transparency. However, as the impact of the resilience-promoting measures on health and well-being of employees has only rarely been the subject of empirical studies so far, this represents a wide open field for research.

Outcomes for subject area “holistic production principles”

With the objective of economic efficiency, numerous methods exist in the second large subject area “holistic production”, focussing on work organisation under dynamic environmental conditions. With regard to resilience and cost-effectiveness, various authors refer to a trade-off between fluctuation resilience and short-term efficiency under error-free conditions, as resources set aside to compensate for fluctuations are not fully available for regular processes.

At the operational level, a range of production methods is available as established design knowledge in order to design industrial processes efficiently and, at the same time, resilient under increasingly dynamic environmental conditions, such as shorter supply chains, thus maintaining long-term cost-effectiveness.

A systematic classification of production methods on the basis of six so-called standard elements of integrated production systems (IPS) offers a comprehensive overview of this design knowledge. Each of the elements contains three to four so-called attributes or subcategories. The subcategories of the element “logistics and production management”, for instance, are “synchronisation of demand and production”, flexibility of process chains”, “consistent production”, and “flow orientation”.

In summary, numerous effects on the working condition factors of the project can be postulated using the different design methods. For instance, feedback is deliberately increased by the task and the transparency of the work processes. The factor of “latitude for initiative and decision-making, assignment variability” is equally often affected, albeit in both directions: Some methods enrich the activity with further assignments, e. g. worker control. Other methods deliberately limit the latitude for initiative in order to prevent errors, e. g. poka-yoke. A fourth working condition factor which can be impacted by several integrated production systems is time constraints and pressure to perform, as several methods intensify the working task.

To study the association of modern production systems with mental outcomes further, a review of the impact of lean production systems on musculoskeletal disorders and psychosocial stress of employees was additionally included. It was found in this context that the impact of lean production on psychosocial stress is not exclusively negative, but to a certain degree depends on the sector, the weighting and operational application of the individual elements by the organisational leadership.

Establishment of principles and research questions

Overall, it has been found that many measures of resilient design of organisations can be traced to a manageable number of basic principles which can be systematically ordered applying the developed model. This includes, for instance, the improvement of communication structures within an organisation. This refers both to the frequent exchange of information between different hierarchic levels and to a horizontal flow of information. Another basic principle is the establishment of buffers which, in various forms of implementation, is practised both to ensure the safety of technical systems against the impact of faults and to efficiently safeguard production in consideration of a fluctuating flow of goods. A third recurring basic principle consists of improved qualification and increased latitude for initiative on the level of the persons determining operations, in order to be able to adapt processes without the need for complicated decision-making processes in case of a disturbance. Empirical evidence of the effectiveness of these measures is only available for individual cases. In addition, a direct impact of resilient organisational work design on loads and mental health must be assumed. For instance, resilience-promoting measures, such as the establishment of buffers, can also directly lead to an increase in work intensity or shorter rest breaks and recovery periods.

At the same time, it is obvious that many research questions remain unresolved in this subject area. Both a consistent definition and adequate measurement methods for organisational resilience and resilient work design are lacking for the most part. Similarly, few empirical studies have been conducted on the impact of organisational resilience on mental health.

For the complete review see

www.baua.de/de/Publikationen/Fachbeitraege/F2353-5.html

A2 Expert discussions

A2.1 Leadership, moderation and sponsorship

The following members of the Scientific Advisory Board of BAuA have been members of the committee on the project “Mental health in the working world”:

- Prof Dr Eva Bamberg, head of the field of occupational and organisational psychology, University of Hamburg, Germany
- Prof Dr Stephan Letzel, head of the institute for occupational, social and environmental medicine, Johannes Gutenberg University of Mainz, Germany
- Prof Dr Gisela Mohr, Prof. em. occupational and organisational psychology, University of Leipzig, Germany
- Prof Dr Klaus Scheuch, Prof. em. occupational hygiene/occupational medicine, Technical University of Dresden, Germany
- Prof Dr Norbert Semmer, Prof. em. Occupational and organisational psychology, University of Bern, Switzerland

All expert discussions were led by Isabel Rothe, president of the BAuA, with the support by the external moderator Dr Knuth Dohse. Altogether, 58 renowned scientific experts from Germany, Austria, Switzerland, the Netherlands, the United Kingdom and the USA took part in the events. The members of the committee of the Scientific Advisory Board also accompanied the preparation and the implementation of the expert discussions as sponsors.

A2.2 Course of the expert discussions

In the expert discussions on the subject areas of “working task”, “leadership and organisation”, “working time” and “technical factors”, the participants discussed the scoping reviews of the subject area in the framework of a poster session on the first day of the expert discussion. Individual experts had provided written comments on one scoping review each in advance, which were used as basis for this discussion. The other talks and discussions on the first and second day went beyond the findings on the individual working condition factors and examined the interdependencies and the intersections of the respective subject area. Additionally, possible focal points of action and design objectives in the respective subject area were discussed. A sponsor of the expert discussion from the committee of the Scientific Advisory Board then headed a discussion on the further research requirements in the respective subject area. The two expert discussions on the interdisciplinary topics of “design

approaches” and “mental health” exclusively examined comprehensive aspects based on the overall analysis of the scoping reviews. Here, a sponsor from the committee led the discussion on the research requirement as well.

A2.3 Expert discussion on the subject area of “Working task”

The subject area of “working task” was assigned with the following working condition factors:

- Latitude for activity at work (E. Bradtke, M. Melzer, L. Röllmann & U. Rösler, BAuA)
- Latitude for initiative and decision-making, assignment variability (P. H. Rosen, BAuA)
- Completeness (E. Bradtke & M. Melzer, BAuA)
- Work intensity (N. Stab, S. Jahn & A. Schulz-Dadaczynski, BAuA)
- Emotional labour (I. Schöllgen & A. Schulz, BAuA)
- Disturbances and interruptions (T. Rigotti, Johannes Gutenberg University of Mainz)
- Traumatic stress (I. Schöllgen & A. Schulz, BAuA)

Twelve external experts from Germany and abroad actively participated in the intensive discussion during the event:

- Prof Dr Fritz Böhle, Institut für Sozialwissenschaftliche Forschung e.V. Munich, Germany
- Prof Dr Achim Elfering, University of Bern, Switzerland
- Prof Dr Andrea Fischbach, German Police University, Germany
- Prof Dr Ekkehart Frieling, Institut für wissenschaftliche Organisations- und Personalentwicklung, Germany
- Prof Dr Jürgen Glaser, University of Innsbruck, Austria
- Prof Dr Winfried Hacker, Technical University of Dresden, Germany
- Dr Ute Hülshager, University of Maastricht, Netherlands
- Dr Nick Kratzer, Institut für Sozialwissenschaftliche Forschung e.V., Munich, Germany
- Prof Dr Andreas Krause, University of Applied Sciences of North-Western Switzerland, Switzerland
- Prof Dr Thomas Rigotti, Johannes Gutenberg University of Mainz, Germany
- Prof Dr Niclas Schaper, University of Paderborn, Germany
- Prof Dr Dieter Zapf, University of Frankfurt, Germany

A2.4 Expert discussion on the subject area of “Leadership and organisation”

The following working condition factors were assigned to the subject area of “leadership and organisation”:

- Leadership (D. Montano, A. Reeske-Behrens & F. Franke, BAuA)
- Social relationships (S. Drössler, A. Steputat, M. Schubert, U. Euler & A. Seidler, Technical University of Dresden)
- Organisational justice (C. Haupt, E.-M. Backé & U. Latza, BAuA)
- Atypical forms of employment (L. Hünefeld, BAuA)
- Job insecurity (B. Köper & S. Gerstenberg, BAuA)

Thirteen external experts from German research institutions as well as from other countries engaged in the intensive discussions during the event:

- Prof Dr Manfred Bornewasser, University of Greifswald, Germany
- Dr Maike Debus, University of Zurich, Switzerland
- Prof Dr Nico Dragano, Heinrich Heine University of Düsseldorf, Germany
- Prof Dr Jörg Felfe, University of the Federal Armed Forces Hamburg, Germany
- Dr Nathalie Galais, University of Erlangen-Nuremberg, Germany
- Prof Dr Gudela Grote, Swiss Technical University of Zurich (ETHZ), Switzerland
- Prof Dr Klaus Moser, University of Erlangen-Nuremberg, Germany
- Dr Matthias Nübling, Freiburg Research Centre for Occupational Science, Germany
- Prof Dr Kathleen Otto, Philipps University of Marburg, Germany
- Prof Dr Birgit Schyns, Durham University, United Kingdom
- Prof Dr Andreas Seidler, Technical University of Dresden, Germany
- Dr Eva Selenko, Sheffield University, United Kingdom
- Prof Dr Dieter Zapf, University of Frankfurt, Germany

A2.5 Expert discussions on the subject area of “Working time”

The subject area of “working time” includes the following working condition factors:

- Atypical working time (M. Amlinger-Chatterjee, BAuA)
- Rest breaks (J. Wendsche & A. Lohmann-Haislah, BAuA)
- Detachment (J. Wendsche & A. Lohmann-Haislah, BAuA)
- Mobility (A. Ducki & H. T. Nguyen, Beuth Technical University, Berlin)
- Work-related permanent availability (B. Pangert, N. Pauls & H. Schüpbach, Albert Ludwigs University of Freiburg)
- Work-life balance (A. M. Wöhrmann, BAuA)

Fourteen external experts from Germany and abroad intensively engaged in the discussions during the event:

- Dr Anna Arlinghaus, XIMES GmbH, Germany
- Prof Dr Barbara Beham, The Berlin School of Economics and Law, Germany
- Prof Dr Carmen Binnewies, University of Münster, Germany
- Prof Dr Antje Ducki, Beuth Technical University Berlin, Germany
- Charlotte Fritz, PhD, Portland State University, United States
- PD Dr Johannes Gärtner, XIMES GmbH, Austria
- Prof Dr Petra Liselotte Klumb, University of Freiburg/Université de Fribourg, Switzerland
- Prof Dr Friedhelm Nachreiner, GAWO e. V., Germany
- Dr Barbara Pangert, Albert Ludwigs University of Freiburg, Germany
- Dr Nina Pauls, Albert Ludwigs University of Freiburg, Germany
- Dr Hartmut Seifert, Wirtschafts- und Sozialwissenschaftliches Institut (WSI), Germany
- Prof Dr Sabine Sonntag, University of Mannheim, Germany
- Prof Dr Karlheinz Sonntag, University of Heidelberg, Germany
- Dr Alexandra Wagner, FIA GmbH, Germany

A2.6 Expert discussion on the subject area of “Technical factors”

In the subject area of “technical factors”, the following working condition factors were discussed:

- Noise (A. Liebl & M. Kittel, Fraunhofer-Institut für Bauphysik)
- Lighting (J. Krüger, BAuA)
- Climate (K. Bux & C. Polte, BAuA)
- Human-machine interaction (S. Robelski, BAuA)
- Human-computer interaction in the office (K. Höhn, A. Jandová, S. Paritschkow & M. Schmauder, Technical University of Dresden)

Nine external experts from Germany and Switzerland actively participated in the intensive discussions during the event:

- Prof Dr. Klaus Bengler, Technical University of Munich, Germany
- Prof Dr Ekkehart Frieling, Institut für wissenschaftliche Organisations- und Personalentwicklung, Germany
- Prof Dr Rainer Guski, Ruhr University of Bochum, Deutschland
- Prof Dr Winfried Hacker, Technical University of Dresden, Germany
- Prof Dr Dietrich Manzey, Technical University of Berlin, Germany
- Prof Dr Jürgen Sauer, University of Freiburg/Université de Fribourg, Switzerland
- Prof Dr Christoph Schierz, Technical University of Ilmenau, Germany
- Prof Dr Christopher M. Schlick †, RWTH Aachen University, Germany
- Prof Dr Martin Schmauder, Technical University of Dresden, Germany

A2.7 Expert discussion on the subject area of “Design approaches”

The following working condition factor was assigned to the subject area of “design approaches”:

- Organisational resilience (M. Hartwig, B. Grauel, B. Lafrenz & A. Barth, BAuA)

During this event, nine external experts from German research institutions and Switzerland discussed design aspects:

- Prof Dr Conny Antoni, University of Trier, Germany
- Prof Dr Gabriele Elke, Ruhr University of Bochum, Germany

- Prof Dr Gudela Grote, Swiss Technical University of Zurich (ETHZ), Switzerland
- Prof Dr Winfried Hacker, Technical University of Dresden, Germany
- PD Dr Christoph Oberlinner, BASF SE, Germany
- Prof Dr Oliver Sträter, University of Kassel, Germany
- Prof Dr G. Günter Voß, Technical University of Chemnitz, Germany
- Prof Dr Jürgen Wegge, Technical University of Dresden, Germany
- Prof Dr Dirk Windemuth, Institut für Arbeit und Gesundheit der Deutschen Gesetzlichen Unfallversicherung (IAG), Germany

A2.8 Expert discussion on the subject area of “Mental health”

No further working condition factors were assigned to the subject area of “mental health”.

Seven external experts from German research institutions and Austria discussed the different levels of prevention:

- Prof Dr Peter Angerer, Heinrich Heine University of Düsseldorf, Germany
- Prof Dr Jürgen Glaser, University of Innsbruck, Austria
- Prof Dr Renate Rau, Martin Luther University of Halle-Wittenberg, Germany
- Prof Dr Steffi Riedel-Heller, University of Leipzig, Germany
- Dr Reingard Seibt, Technical University of Dresden, Germany
- Prof Rüdiger Trimpop, Friedrich Schiller University of Jena, Germany
- Dr Hans-Peter Unger, Asklepios Klinikum Harburg, Germany

A3 Stakeholder discussions

The third project phase, “applying the knowledge”, started with a two-day meeting of the BAuA Board of Trustees with the committee of the Scientific Advisory Board on the project. On the second day, Federal Minister Andrea Nahles (Federal Ministry of Labour and Social Affairs) was also present at the meeting, during which the intermediate results of the projects were discussed. Subsequently, the BAuA conducted 12 stakeholder discussions, which are listed in the table below. The results of the stakeholder discussions are discussed in section 4.3.

Table 18 Stakeholder discussions with occupational safety practice and politics

Date and place	Panel	Chairperson of meeting or participating group
31/08/2016 Hamburg	Discussion of the project results in the context of the joint session of the Commission for Occupational Safety and Safety Engineering of the Federal States (LASI) and the Directors of Prevention of the accident insurance agencies (PLK)	Dr. Volker Kregel, LASI Chairman; Dr. Walter Eichendorf, Deputy Chief Executive Officer of DGUV
07/09/2016 Dresden	Discussion of the project results in the context of the 68 th Session of the Commission for Occupational Safety and Safety Engineering of the Federal States (LASI)	Dr. Volker Kregel, LASI Chairman
27/09/2016 Dresden	Information event on the BAuA project for interested participants at the 11 th Occupational Safety Forum	Dr. Walter Eichendorf, NAK Chairman
26/10/2016 Frankfurt	Presentation of interim results of the project “Mental health in the working world” at the steering committee of the Joint German Occupational Safety Strategy (GDA)	Andreas Horst, BMAS
27/10/2016 Berlin	Briefing on the BAuA project with members of the German Trade Union Confederation (DGB) and individual trade unions	Annelie Buntenbach, member of the senior executive team of the DGB
08/11/2016 Berlin	Briefing on the BAuA project following the session of the steering committee of the Initiative “New Quality of Work” (INQA)	Undersecretary Thorben Albrecht, BMAS
16/11/2016 Berlin	Briefing on the BAuA project in the context of a session of the Confederation of German Employer Associations (BDA), Workgroup on Work Design and Research	Prof. Dr. Ing. Sascha Stowasser, Institute for Applied Occupational Science (ifaa)
25/11/2016 Berlin	Briefing on the BAuA project in the context of the labour policy dialogue of the employer association “Gesamtmetall”	Holger Rademacher, Director of the Department for Occupational Science and Labour Policy, Gesamtmetall
09/01/2017 Berlin	Briefing on the BAuA project in the context of the session of the Federal Board of the United Services Union ver.di	Frank Bsirske, ver.di Chairman
24/01/2017 Dortmund	Briefing with the Board of the VDSI – Association for Safety, Health and Environmental Protection in the Workplace e.V.	Prof. Dr. Rainer von Kiparski, VDSI Chairman
26/01/2017 Berlin	Briefing on the BAuA project with the Industrial Union Industry, Mining, Chemicals (IG BCE)	Ralf Sikorski, Member of the Executive Governing Board of the IG BCE
08/02/2017 Berlin	Information event for members of the Prevention Symposium and workplace health promotion specialists of the health insurers (National Association of Statutory Health Insurance Funds)	Jens Hupfeld, National Association of Statutory Health Insurance Funds

A4 Congress contributions and journal articles

In the sense of a comprehensive discourse with the scientific community, results on selected working condition factors were presented on scientific congresses in the course of the project (see annex A5 on all publications of the project):

Gesellschaft für Arbeitswissenschaft (GfA) [society for occupational safety]

- Spring congress, 2–4 March 2016, University of Aachen, *Arbeit in komplexen Systemen – Digital, vernetzt, human?! [Work in complex systems – digital, interconnected, humane?!]*
Session: Mental health in the working world

During the GfA spring congress 2016, different researchers gave lectures on the individual scoping reviews in a joint session.

Contributions:

Amlinger-Chatterjee, M. (2016d). Scoping Review „Atypische Arbeitszeiten und psychische Gesundheit“.

Bux, L., & Polte, C. (2016a). Klima und psychische Gesundheit in der Arbeitswelt.

Ducki, A., & Gerstenberg, S. (2016). Gesundheitsrelevante Einflussfaktoren, Folgen und Gestaltungsoptionen räumlicher Mobilität.

Krüger, J. (2016d). Scoping Review zum Einfluss der Beleuchtung auf Faktoren der psychischen Gesundheit in der Arbeitswelt.

Pauls, N., Pangert, B., & Schüpbach, H. (2016b). Arbeitsbezogene erweiterte Erreichbarkeit, Gesundheit und Life-Domain-Balance – Stand der Forschung und Ausblick.

Robelski, S., Wischniewski, S., & Adolph, L. (2016). Ergebnisse eines Scoping Reviews zur Mensch-Maschine-Interaktion.

Rosen, P. H., Wischniewski, S., & Adolph, L. (2016). Tätigkeitsspielraum und Aufgabenvariabilität in der Produktion – ein Scoping Review.

Rothe, I., Schütte, M., & Windel, A. (2016). Überblick über das Projekt „Psychische Gesundheit in der Arbeitswelt – Wissenschaftliche Standortbestimmung“.

Schmauder, M., Höhn, K., Jandova, A., & Paritschkow, S. (2016). Mensch-Rechner-Interaktion im Büro: Ergebnisse eines Scoping Reviews.

Stab, N., Jahn, S., & Schulz-Dadaczynski, A. (2016a). Ein Scoping Review zum Thema „Arbeitsintensität“.

Sukowski, H., Brockt, G., Romanus, E., & Adolph, L. (2016). Der Arbeitsumgebungsfaktor „Lärm“: Extraaurale Wirkungen von Lärm am Arbeitsplatz.

Wendsche, J., & Lohmann-Haislah, A. (2016a). Ein Scoping Review zur Wirkung von Arbeitspausen.

Wöhrmann, A. M. (2016e). Arbeitsbedingungen und Work-Life-Balance.

Deutsche Gesellschaft für Arbeitsmedizin und Umweltmedizin (DGAUM) [German society for occupational medicine and environmental medicine]

- 56th Scientific annual conference, 9 – 11 March 2016, University of Munich Session: *Psychische Gesundheit in der Arbeitswelt – Wissenschaftliche Standortbestimmung | Eröffnungsveranstaltung* [Mental health in the working world – Determining the current state of scientific evidence | opening event]

In 2016, the BAuA assumed the leadership for the subject area of “resources and stress factors in the working world” as a cooperation partner at the *DGAUM* annual congress of 2016. In the framework of the opening event, Isabel Rothe, president of the BAuA, gave a ceremonial lecture on this subject area. In several professional lectures, the authors of the scoping reviews presented the results of their research.

Contributions:

Amlinger-Chatterjee, M. (2016a). Atypische Arbeitszeiten.

Drössler, S., Steputat, A., Schubert, M., Euler, U., Rösler, U., & Seidler, A. (2016a). Soziale Beziehungen am Arbeitsplatz. Einflüsse sozialer Ressourcen und sozialer Stressoren auf psychische Gesundheit, Motivation und Leistung.

Haupt, C. M., Backé, E.-M., & Latza, U. (2016c). Organisationale Gerechtigkeit und psychische Gesundheit, Erkrankungen und Leistung.

Hünefeld, L. (2016a). Atypische Beschäftigungsverhältnisse.

Köper, B., & Gerstenberg, S. (2016c). Systematischer Review zum Zusammenhang von Arbeitsplatzunsicherheit und Gesundheit.

Lohmann-Haislah, A., & Wendsche, J. (2016b). Die Arbeit noch im Kopf? Eine Metaanalyse zu Einflussfaktoren und Folgen des mentalen Abschaltens von der Arbeit.

Montano, D. (2016). Führung.

Rothe, I. (2016c). Ressourcen und Stressoren in der Arbeitswelt.

Schöllgen, I., & Schulz, A. (2016a). Emotionsarbeit.

Schöllgen, I., & Schulz, A. (2016g). Traumatische Belastungen im Arbeitskontext.

Schütte, M. (2016). Die Methode der Literaturlaufbereitung im Projekt „Psychische Gesundheit in der Arbeitswelt“.

Stab, N., Jahn, S., & Schulz-Dadaczynski, A. (2016d). Arbeitsintensität und negative Aspekte mentaler Gesundheit.

Wendsche, J., & Lohmann-Haislah, A. (2016e). Ein Scoping Review zur Wirkung von Arbeitspausen auf die Gesundheit.

Wöhrmann, A. M. (2016c). Work-Life-Balance.

Deutsche Gesellschaft für Psychologie (DGPs) [German society for psychology]

- 50th Annual congress, 18–22 September 2016, University of Leipzig Sessions: Working Conditions and Mental Health | *Arbeitsbedingungen und psychische Gesundheit – Anforderungen der Praxis und Konsequenzen für die Forschung* [Working conditions and mental health – requirements of practice and consequences for research]

In the framework of a dedicated conference at the DGPs annual congress of 2016, the results of the project were presented. Additionally, a panel discussion on the subject area of “working conditions and mental health – requirements of practice and consequences for research” with the participation of the president of the BAuA was held.

Contributions:

Amlinger-Chatterjee, M., & Wöhrmann, A. (2016). Atypical working time.

Bradtke, E., & Rösler, U. (2016). Control and complete tasks.

Köper, B., & Gerstenberg, S. (2016d). Systematic review on the relationship of job insecurity and health.

Pauls, N., Pangert, B., & Schüpbach, H. (2016a). Permanent availability.

Rothe, I., Antoni, C. H., Kunz, T., Ohly, S., Semmer, N. K., Wieland, R., & Zijlstra, F. (2016c). *Arbeitsbedingungen und psychische Gesundheit – Anforderungen der Praxis und Konsequenzen für die Forschung*.

Schöllgen, I., & Schulz, A. (2016d). Emotional labour.

Schütte, M., & Windel, A. (2016). Working conditions and mental health: conceptual and methodological design.

Wendsche, J., & Lohmann-Haislah, A. (2016f). Detachment.

Wöhrmann, A. (2016d). Work-life balance.

Deutsche Gesellschaft für Psychiatrie und Psychotherapie, Psychosomatik und Nervenheilkunde e. V. (DGPPN) [German association for psychiatry, psychotherapy and psychosomatics]

- DGPPN congress, 23–26 November 2016, CityCube Berlin, *Psyche – Mensch – Gesellschaft* [mind – human – society]
Leopoldina Symposium: *Die Bedeutung von psychischen Erkrankungen in einer sich ändernden Arbeitswelt* [The significance of mental illnesses in a changing working world]

At the 2016 DGPPN congress, comprehensive aspects of the project and the related requirements to operational design processes were discussed by the president of the *Bundesanstalt*.

Contribution:

Rothe, I. (2016a). Psychische Gesundheit – Anforderungen an betriebliche Gestaltungsprozesse.

Leopoldina-Arbeitsgruppe „Arbeit und psychische Erkrankungen“ [Leopoldina work group “Work and mental illnesses”]

- Meeting of the Leopoldina work group on 6 February 2017, University of Munich

Against the background of the project, Isabel Rothe and Prof Dr Martin Schütte were invited by the German National Academy of Sciences Leopoldina to discuss possible recommendations in the subject area within the framework of a meeting of the work group “Work and mental illnesses”.

The results of individual working condition factors were also presented on other subject-specific conferences – both on a national as well as on an international level:

Department of lighting technology of the Technical University of Berlin

- Ninth symposium of light and health, 6 to 7 October 2016, Forum Treptow, Berlin

Contribution:

Krüger, J. (2016c). Scoping Review zum Einfluss der Beleuchtung auf Faktoren der psychischen Gesundheit in der Arbeitswelt.

TNO & Department of Public and Occupational Health, VU University Medical Centre

- Fourth International Conference on Well-being at Work, 25 May – 1 June 2016, Amsterdam
Session: Job demands and resources: models

Contribution:

Rosen, P. H., & Wischniewski, S. (2016). The concept of job control in manufacturing – results of a scoping review.

HCI International

- 3rd International Conference on HCI in Business, Government and Organizations, 17–22 July 2016, Toronto

Session: HCI and Occupational Safety and Health – II

Contribution:

Robelski, S., & Wischniewski, S. (2016). Scoping Review on Human-Machine Interaction and Health and Safety at Work.

A special edition of the *Zeitschrift für Arbeitswissenschaft* [journal on occupational science], dealing with selected working condition factors, was published in early 2017:

Zeitschrift für Arbeitswissenschaft

Amlinger-Chatterjee, M., & Wöhrmann, A. M. (2017). Flexible Arbeitszeiten. *Zeitschrift für Arbeitswissenschaft*, 17(1), 39–51. doi:10.1007/s41449-017-0047-x.

Lenhardt, U. (2017). Psychische Belastung in der betrieblichen Praxis. *Zeitschrift für Arbeitswissenschaft*, 71(1), 6–13. doi:10.1007/s41449-017-0045-z

Schulz, A., & Schöllgen, I. (2017). Emotionsarbeit – Ein Review zu Gestaltungsaussagen. *Zeitschrift für Arbeitswissenschaft*, 71(1), 26–38. doi:10.1007/s41449-017-0046-y

Schütte, M., & Windel, A. (2017). Psychische Gesundheit in der Arbeitswelt – Wissenschaftliche Standortbestimmung. *Zeitschrift für Arbeitswissenschaft*, 71(1), 1–5. doi:10.1007/s41449-017-0050-2.

Stab, N., & Schulz-Dadaczynski, A. (2017). Arbeitsintensität: Ein Überblick zu Zusammenhängen mit Beanspruchungsfolgen und Gestaltungsempfehlungen. *Zeitschrift für Arbeitswissenschaft*, 71(1), 14–25. doi:10.1007/s41449-017-0048-9

Wendsche, J., & Lohmann-Haislah, A. (2017b). Detachment als Bindeglied zwischen psychischen Arbeitsanforderungen und ermüdungsrelevanten psychischen Beanspruchungsfolgen: Eine Metaanalyse. *Zeitschrift für Arbeitswissenschaft*, 71(1), 25–70. doi:10.1007/s41449-017-0044-0

A5 Literature featuring project outcomes

Amlinger-Chatterjee, M. (2016a). Atypische Arbeitszeiten. In DGAUM, Deutsche Gesellschaft für Arbeitsmedizin und Umweltmedizin, 56. Wissenschaftliche Jahrestagung 2016 (p. 81). Stuttgart: Gentner.

Amlinger-Chatterjee, M. (2016b). Psychische Gesundheit in der Arbeitswelt. Atypische Arbeitszeiten. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/3a

Amlinger-Chatterjee, M. (2016c). Atypische Arbeitszeiten. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/3a

Amlinger-Chatterjee, M. (2016d). Scoping Review „Atypische Arbeitszeiten und psychische Gesundheit“. In GfA, Gesellschaft für Arbeitswissenschaft e.V., Arbeit in komplexen Systemen – Digital, vernetzt, human?! Bericht zum 62. Arbeitswissenschaftlichen Kongress. Dortmund: GfA-Press.

Amlinger-Chatterjee, M., & Wöhrmann, A. (2016). Atypical working time. In I. Fritsche (ed.), 50. Kongress der Deutschen Gesellschaft für Psychologie, Leipzig (p. 412–413). Lengerich: Pabst.

Amlinger-Chatterjee, M., & Wöhrmann, A. M. (2017). Flexible Arbeitszeiten. Zeitschrift für Arbeitswissenschaft, 71(1), 39–51. doi:10.1007/s41449-017-0047-x

BAuA (2014). Psychische Gesundheit in der Arbeitswelt – Praktisches Gestaltungswissen ist gefragt. Baua: Aktuell. Dortmund, 14 (3), 2–4.

BAuA (2016). Überblick über das Projekt „Psychische Gesundheit in der Arbeitswelt“. doi:10.21934/baua:fokus20160720

Beermann, B., Köper, B., Adolph, L., Schütte, M., & Windel, A. (2016). Psychische Gesundheit in der Arbeitswelt. In Arbeit weiter Denken, Werkheft 02: Wie wir arbeiten (wollen) (p. 94–97). Berlin: Bundesministerium für Arbeit und Soziales.

Bradtke, E., & Melzer, M. (2016a). Vollständige Arbeitstätigkeiten. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/1c

Bradtke, E., & Melzer, M. (2016b). Psychische Gesundheit in der Arbeitswelt. Vollständigkeit. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/1c

- Bradtke, E., Melzer, M., Röhlmann, L., & Rösler, U. (2016a). Expertise: Tätigkeitsspielraum. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/1a
- Bradtke, E., Melzer, M., Röhlmann, L., & Rösler, U. (2016b). Psychische Gesundheit in der Arbeitswelt. Tätigkeitsspielraum in der Arbeit. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/1a
- Bradtke, E., & Rösler, U. (2016). Control and complete tasks. In I. Fritsche (publ.), 50. Kongress der Deutschen Gesellschaft für Psychologie (p. 412). Leipzig: Lengerich.
- Bux, L., & Polte, C. (2016a). Klima und psychische Gesundheit in der Arbeitswelt. In GfA, Gesellschaft für Arbeitswissenschaft e.V., Arbeit in komplexen Systemen – Digital, vernetzt, human?! Bericht zum 62. Arbeitswissenschaftlichen Kongress. Dortmund: GfA-Press.
- Bux, L., & Polte, C. (2016b). Klima. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/4c
- Bux, L., & Polte, C. (2016c). Psychische Gesundheit in der Arbeitswelt. Klima. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/4c
- Drössler, S., Steputat, A., Schubert, M., Euler, U., Rösler, U., & Seidler, A. (2016). Soziale Beziehungen am Arbeitsplatz. Einflüsse sozialer Ressourcen und sozialer Stressoren auf psychische Gesundheit, Motivation und Leistung. In DGAUM, Deutsche Gesellschaft für Arbeitsmedizin und Umweltmedizin, 56. Wissenschaftliche Jahrestagung 2016 (p. 59–60). Stuttgart: Gentner.
- Drössler, S., Steputat, A., Schubert, M., Euler, U., & Seidler, A. (2016a). Soziale Beziehungen am Arbeitsplatz. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/2b
- Drössler, S., Steputat, A., Schubert, M., Euler, U., & Seidler, A. (2016b). Psychische Gesundheit in der Arbeitswelt. Soziale Beziehungen. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/2a
- Ducki, A., & Gerstenberg, S. (2016). Gesundheitsrelevante Einflussfaktoren, Folgen und Gestaltungsoptionen räumlicher Mobilität. In GfA, Gesellschaft für Arbeitswissenschaft e.V., Arbeit in komplexen Systemen – Digital, vernetzt, human?! Bericht zum 62. Arbeitswissenschaftlichen Kongress. Dortmund: GfA-Press.
- Ducki, A., & Nguyen, H. T. (2016). Psychische Gesundheit in der Arbeitswelt. Mobilität. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/3d
- Ducki, A., Nguyen, H. T., & Gerstenberg, S. (2016). Räumliche Mobilität. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/3d
- Hartwig, M., Kirchhoff, B., Lafrenz, B., & Barth, A. (2016a). Organisationale Resilienz. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/5

- Hartwig, M., Kirchoff, B., Lafrenz, B., & Barth, A. (2016b). Psychische Gesundheit in der Arbeitswelt. Organisationale Resilienz. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/5
- Haupt, C. M., Backé, E.-M., & Latza, U. (2016a). Gerechtigkeit: 1. Organisationale Gerechtigkeit. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/2c.2
- Haupt, C. M., Backé, E.-M., & Latza, U. (2016b). Gerechtigkeit: 2. Belohnung/Effort-Reward-Imbalance. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/2d.2
- Haupt, C. M., Backé, E.-M., & Latza, U. (2016c). Organisationale Gerechtigkeit und psychische Gesundheit, Erkrankungen und Leistung. In DGAUM, Deutsche Gesellschaft für Arbeitsmedizin und Umweltmedizin, 56. Wissenschaftliche Jahrestagung 2016 (p. 59). Stuttgart: Gentner.
- Haupt, C. M., Backé, E.-M., & Latza, U. (2016d). Psychische Gesundheit in der Arbeitswelt. Gerechtigkeit und Belohnung. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:bericht20160713/2d
- Höhn, K., Jandová, A., Paritschkow, S., & Schmauder, M. (2016a). Mensch-Rechner-Interaktion im Büro. Poster im Rahmen des Projekts „Psychische Gesundheit in der Arbeitswelt“. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. doi:10.21934/baua:berichtkompakt20161005/4e
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- Hünefeld, L. (2016a). Atypische Beschäftigungsverhältnisse. In DGAUM, Deutsche Gesellschaft für Arbeitsmedizin und Umweltmedizin, 56. Wissenschaftliche Jahrestagung 2016 (p. 83–84). Stuttgart: Gentner.
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