



# **Review of existing supporting scientific knowledge to underpin standards of good practice for key work-related stressors- Phase 1**

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**The Institute for Employment Studies**  
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## **RESEARCH REPORT 024**



# **Review of existing supporting scientific knowledge to underpin standards of good practice for key work-related stressors- Phase 1**

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This research was undertaken on behalf of the Health and Safety Executive (HSE) in order to identify the best available evidence on the ways in which the following nine stressors affect individuals at work:

- poorly designed/managed workload
- poorly designed/managed work scheduling
- poorly designed/managed work design
- poorly designed/managed physical environment
- lack of skill discretion
- lack of decision authority
- lack of appropriate proactive support
- lack of appropriate reactive support
- poorly designed/managed procedures for eliminating damaging conflict at individual/team level (bullying/ harassment).

The overriding aim for the research was to conduct the review in as explicit and objective a manner as possible. To ensure that this was the case the review was, so far as was possible, conducted in line with principles of evidence based approaches: ie, a systematic way of pulling together and assessing the quality of evidence around a given research question and making recommendations for practice.

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This project was conducted on behalf of the Health and Safety Executive (HSE).

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# Executive Summary

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## Introduction

This research was undertaken on behalf of the HSE in order to identify the best available evidence on the ways in which the following nine stressors affect individuals at work:

- poorly designed/managed workload
- poorly designed/managed work scheduling
- poorly designed/managed work design
- poorly designed/managed physical environment
- lack of skill discretion
- lack of decision authority
- lack of appropriate proactive support
- lack of appropriate reactive support
- poorly designed/managed procedures for eliminating damaging conflict at individual/team level (bullying/harassment).

## Objectives

The specific objective of the review is to answer the following four questions by providing an up-to-date, comprehensive and authoritative critical review and analysis of the *best available* evidence.

- Question 1: What proportions of the population are exposed to harmful levels of each of the nine stressors?
- Question 2: What are the effects of the nine stressors on health, well-being and organisational performance?
- Question 3: What are the mechanisms through which stressors have effects on health, well-being and organisational performance?
- Question 4: What organisational activities reduce the levels of each of the nine stressors, and what are the subsequent effects of this on health, well-being and organisational performance?

The evidence in respect of each of these four questions is described in Chapters 3, 4, 5 and 6.

## **Methodological issues and approach**

The overriding aim for the research was to conduct the review in as explicit and objective a manner as possible. To ensure that this was the case the review was, so far as was possible, conducted in line with principles of evidence based approaches: *ie*, a systematic way of pulling together and assessing the quality of evidence around a given research question and making recommendations for practice.

### **The expert adviser panel**

In order to assist the research team in this (and a key strength of the research is that) a panel of expert advisers was appointed. The expert adviser panel consisted of:

- Ronny Lardner, Director, The Keil Centre
- Associate Professor Sharon Parker, Australian Graduate School of Management, University of Sydney/University of New South Wales
- Dr Kathy Parkes, Reader, University of Oxford
- Professor Roy Payne, Institute of Work Psychology, University of Sheffield
- Dr Shirley Reynolds, founder editor of the journal *Evidence Based Mental Health*, University of East Anglia
- Professor Peter Warr, Institute of Work Psychology, University of Sheffield.

Details of the expert advisers are given in Chapter 1. Their involvement in the project is specified in Chapter 2.

Specific criteria were developed for each stage of the review. The criteria were agreed with an external panel of expert advisers, protocols were developed for the review process and reviewers were all trained in the use of the materials. Full details of the procedures are given in the methodology, and the materials developed are documented in the Appendices.

### **Identification of literature**

A major challenge for this research was to extract the best available evidence from the very extensive body of papers that have been published on work related stress. Given available time and resources, it was proposed to use the knowledge of the expert advisers to pinpoint what they considered to be the best available evidence for each stressor area in relation to each of the research

questions. This was then supplemented by searches on recent publications for a selected range of high quality journals.

Once this was done, articles were obtained, sifted to ensure relevance to the current review and those which passed the sift stage were fully reviewed. This procedure, along with other methodological considerations is fully covered in Chapter 2.

## Findings

Overall, the amount of available evidence varied enormously across research questions and stressor areas. By far the majority of work included in this review focuses on the impact of different types of demands, controls and supports on work and health-related outcomes. Relatively little evidence was available for question 1. The bulk of the evidence relates to question 2, evidence of the impact that each of the nine stressors has on work and health-related outcomes. Questions 3 and 4 (how the stressors cause the harm, and what interventions work to reduce the presence of the stressors in the workplace) also drew on a much smaller body of literature. Findings for each of the four research questions are presented in turn.

### **What proportions of the population are exposed to harmful levels of each of the nine stressors?**

Chapter 3 reviewed the best available evidence concerning what proportion of the population are exposed to harmful levels of each of the nine stressors. Although only one UK study could be found to contribute evidence to this review question, this study did provide information that related to eight of the nine stressors.

The evidence is based on self-report data usually collected at a single time point. This means that it tells us about how individuals perceive and experience their workplace, rather than about the actual levels of problems that exist.

In summary, this study of a sample of the general population found that:

- over 80 per cent felt themselves to have experienced high work pace and intensity
- over 80 per cent reported a lack of variety in their work
- over half felt that they lacked decision authority over their work environment and who they work with
- about one-third perceived themselves as being exposed to unpredictable, long, unsociable or inflexible work schedules
- a quarter said they were exposed to physical hazards such as noise and harmful substances

- less than a quarter felt they were exposed to a lack of social support at work
- seven per cent reported that they had experienced bullying.

Similar figures were apparent from other European surveys. However, evidence from specific populations demonstrated that some employees were more at risk than others.

It is also important to note that exposure is different from impact. The fact that a certain percentage of employees perceive, for example, that they have a high work pace (*ie* are exposed to it) does not mean that that percentage will go on to suffer ill-effects (*ie* have an impact from it).

### **What are the effects of the nine stressors on health, well-being and organisational performance?**

This chapter reviewed the best available evidence concerning the impact of exposure to each of the nine stressors. The quantity and consistency of evidence for each stressor varied enormously. The main findings for each stressor are summarised below.

- **Workload:** a mixed pattern of relationships was found – some evidence that increases in workload had a negative impact, some evidence of low work pace having a similarly negative effect, and a number of studies finding evidence for no relationship.
- **Work scheduling:** although based on a small number of studies, consistent evidence was found for the negative impact of shift working and the positive impact of flexible work schedules.
- **Work design:** based on the limited evidence, there were improvements to the work-related outcomes, but not to mental health, following work design improvements.
- **Physical environment:** the majority of studies found evidence of no relationship between physical environment stressors and both work-related and health-related outcomes.
- **Other forms of demand:** general job demands were found to have a negative impact on outcomes, as were job-specific demands in particular occupations (*eg* nurses).
- **Skill discretion:** low skill discretion had a negative impact on a range of work-related outcomes, but the evidence suggests a less consistent impact on health-related outcomes.
- **Decision authority:** autonomy showed a positive impact on health-related outcomes, but there was mixed evidence for its impact on work-related outcomes, with a number of studies finding evidence of no relationship. Decision latitude had a more consistent positive impact on both work-related and health-related outcomes.

- Other forms of control: low job control had a negative impact on work-related outcomes, but there was mixed evidence in relation to health outcomes – some studies found evidence of a negative impact, but others found evidence of no impact.
- Support: low support was found to have a negative impact on both work-related and health-related outcomes.
- Bullying/harassment: social conflicts and negative relationships at work had negative effects for both work-related and health-related outcomes.

### **What are the mechanisms through which stressors have effects on health, well-being and organisational performance?**

The evidence described in Chapter 5 highlights a number of patterns concerning the nature of the link between stressors and outcomes. In particular, it demonstrates:

- the combined effects of multiple stressors
- differences between individuals
- indirect links between stressors and their outcomes, and
- non-linear relationships.

The most frequent conclusion of the evidence reviewed here was that stressors combine to produce negative outcomes. In some cases, a stressor only had a negative impact when it occurred with another stressor. In other cases, the negative effect of a single stressor was made worse by the presence of another stressor. In particular, the evidence consistently demonstrated the combined negative effects of high job demands (workload, job complexity, or general job demands) and low job control (decision latitude or general job control). In addition, high levels of social support were found to protect against these negative effects. These findings reflect the importance of Karasek's job demand-control model (Karasek, 1979) in this area. Other combinations of stressors have been examined to a much lesser degree.

The impact of stressors on outcomes was also found to vary with a number of different individual factors. A number of studies demonstrated how the effects of workload, job control and social support varied with age, gender and employment grade. Stressors were also found to combine with some personality factors to affect various outcomes. More specifically, Type A behaviour, hostility, and the need for social approval were found to increase the negative impact of some stressors.

Some stressors were found to have their negative effects through other stressors or behaviours. For example, workload had a negative impact via reduced control and increased time pressure, and decision authority had its negative impact via organisational

commitment. This suggests that the link between stressors and outcomes may involve sequences of effects that need to be identified.

Finally, the evidence suggests that some of the relationships between stressors and outcomes are non-linear. Incremental changes in a stressor do not necessarily lead to proportional changes in the outcome. For example, both very low and very high levels of time pressure were found to have negative effects. However, few of the studies included in the review explicitly examined whether the relationships between stressors and outcomes were non-linear in this way.

### **What organisational activities reduce the levels of each of the nine stressors, and what are the subsequent effects of this on health, well-being and organisational performance?**

Despite the small number of studies, the intervention studies that were reviewed, generally showed positive results.

The socio-technical interventions were particularly successful. The two interventions designed to reduce workload showed improved mental efficiency, satisfaction and better mental health at lower levels of workload. The four socio-technical interventions designed to improve work schedules showed consistently positive results. Compressed work weeks led to improved satisfaction, productivity and effectiveness, and reduced anxiety. Flexitime schedules also led to improved performance and satisfaction with schedules, better relations at work, improved family and social life, and reduced absence. Changes to work organisation (*ie* task identity) were accompanied by increased motivation, job satisfaction, performance, mental health and labour retention. The socio-technical intervention designed to improve decision authority led to increased autonomy and various positive outcomes.

The impact of psychosocial interventions was slightly less consistent, although still encouraging. The four psychosocial activities designed to improve decision authority did lead to some increased participation and autonomy, and were accompanied by improvements in performance, job satisfaction and mental health, and reductions in absence and intention to leave. However, some of the interventions had marginal effects and did not produce changes in subjective health, anxiety and other outcomes.

The least positive effects were found with interventions designed to improve physical environment, skill discretion, or general levels of demand and control. These had negligible effects, although this partly reflects the small number of studies that contributed evidence.

The general pattern appears to be that more targeted and focused interventions, aimed at changing a specific aspect of work, are more successful than psychosocial interventions which may encompass multiple changes, and interventions focused on a general work characteristic (such as demands or control).

## **Discussion of specific findings**

A detailed discussion is presented in Chapter 7. Main highlights are given below.

### **Research Question 1**

This asked the question: What proportions of the population are exposed to harmful levels of each of the nine stressors?

While the importance of this question is clear, this review found that there is very little evidence on which to draw in formulating an answer. Question 1 was therefore revised to:

**‘What proportions of the population report that each of the nine stressors is in some way a problem for them?’**

While this revised question differs significantly from the original question, it provides a means of reviewing the best available evidence which may be relevant to the original question.

From the limited available evidence it appears that varying proportions of the population are exposed to varying levels of stressors. High work intensity, high work pace, and low variety were the most prevalent stressors, followed by a lack of decision authority over specific aspects of work and problematic work schedules. Whilst it is possible to conclude that large numbers of respondents report experiencing high workload or little control over the way that they do their work (and subsequent research indicates that these characteristics can, at least in some circumstances, be damaging, and therefore worth caring about), there are still gaps in our knowledge in this area. What we do not know, is the extent to which these levels of stressors are harmful or viewed as problematic. In general, the available evidence cannot provide an answer to this question. We do not know what proportions of the population are exposed to harmful levels of each of the nine stressors.

### **Research Question 2**

This question asked: What are the effects of the nine stressors on health, well-being and organisational performance?

The number of studies available across each of the stressor areas ranged from four to 24. Given the inclusion criteria used to



identify papers, the papers were of the highest available quality. There were, however, a number of weaknesses, which are detailed in Chapter 7.

For some stressor areas there were clear relationships between stressors and a range of outcomes. Stressors grouped under work scheduling showed clear and consistent effects on outcomes. Likewise, decision latitude had a consistent positive impact on both work-related and health outcomes. Both low support and negative interpersonal relationship stressors had negative effects on outcomes. Higher levels of general demands and some forms of job-specific demands were found to be related to health and work-related outcomes.

Some stressors displayed negative effects on some outcomes, but not on others. Work design improvements and skill discretion were related to subsequent work-related outcomes, but not to health outcomes.

For other stressor groups, the results showed evidence of negative effects but also evidence of no effects. Autonomy showed a positive impact on health-related outcomes and some work-related outcomes, but some studies found evidence of no impact on certain work-related outcomes. Low job control had a negative impact on work-related outcomes and some health-related outcomes, but some studies found evidence of no impact on health-related outcomes. Although both high workload and low work pace showed negative outcomes, other studies found evidence of no impact of high workload.

For some other categories of stressor, such as physical environment, few effects were found.

For each of the nine stressor areas, at least some evidence was found of their adverse effects, and in general, effect sizes were small to moderate. For some stressors (*eg* physical environment) limited effects were found, whilst for others fairly consistent effects were found (*eg* work schedule, decision latitude, support), and for others the effects were mixed. There is therefore no uniform base of evidence about the effects of the nine stressors. It is not uniform in the sense that the quality and quantity of evidence varies across the nine stressor areas. It is also not uniform in that the nature of the findings across the nine stressor areas varies considerably.

Evidence of inconsistent results implies that there are moderators of the relationship. These could be individual, work/organisational or methodological. A lay interpretation might be that mixed/inconsistent results means there probably isn't a link, whereas an alternative interpretation is that there may well be links, but they do not occur for all contexts or all individuals. The implication is that we need to become more sophisticated in our

theories and tests in order to become more precise in identifying for whom, how and when such links might exist.

### **Research Question 3**

This question asked: What are the mechanisms through which stressors have effects on health, well-being and organisational performance?

The number of studies available across each of the stressor areas ranged from one to ten. These were a sub-set of those studies that contributed to question 2, hence the same considerations of quality apply.

The evidence demonstrated a number of different mechanisms through which the stressors affect outcomes.

Stressors appear to combine to affect health, well-being and performance. Some evidence demonstrated how stressors may only have a negative impact when another stressor is present (*eg* high workload is associated with poor well-being only under conditions of low control). Other evidence showed that the negative effects of stressors may be made worse by the presence of other stressors (*eg* the negative effects of high demands and low decision latitude are increased when they are experienced together). This implies that if you want to assess how stressful an environment is, you need to assess demands controls and supports together. However, whilst this evidence does largely focus on combinations of demands, control, and support stressors, it usually examines how just two stressors combine.

The effects of stressors also vary with individual differences and socio-cultural factors. It is possible that these variations arise from differences in cognitive processing that shape hazard perception. In addition, the link between stressors and outcomes may involve sequences of effects, involving other stressors, behaviours, or affective reactions in a causal chain. Finally, stressors can have non-linear relationships with outcomes.

While a number of mechanisms have been researched and the evidence for them reviewed, there are many more possible mechanisms which have thus far not been empirically examined to sufficient standard to be included in this review. With a few exceptions, our understanding of such mechanisms remains limited.

### **Research Question 4**

This question asked: What organisational activities reduce the levels of each of the nine stressors and what are the subsequent effects of this on health, well-being and organisational performance?

In total, eight papers were found to provide evidence to address this question. The number of studies available across each of the stressor areas ranged from none to five. The number of studies was expected to be small, as previous reviews have failed to find a considerable body of evidence.

The quality of these studies was generally good, given the inclusion criteria used to identify papers.

Despite the small number of studies, the intervention studies that were reviewed, generally showed positive results. The socio-technical interventions, such as changes to workload and work schedule, clearly reduced the presence of stressors and had positive effects on well-being and performance measures. The effect of psychosocial interventions were slightly less consistent. The psychosocial activities designed to improve decision authority were most successful, leading to increased participation and autonomy, and accompanied by improvements in well-being and performance. However, some of the interventions had marginal effects or negligible effects. The general pattern appears to be that more targeted and focused interventions, aimed at changing a specific aspect of work, are more successful than psychosocial interventions, which may encompass multiple changes, and interventions focused on a general work characteristic (such as demands or control).

It is possible that the small number of intervention studies is due to a publication bias, *ie* intervention studies which find non-significant or negative results are not published.

What this means is that some kinds of interventions in some contexts do appear to reduce stressors, which in turn reduces the effects of those stressors. At the same time the quantity of evidence is small.

## **General discussion points:**

- **No evidence of a relationship vs evidence of no relationship:** An absence of evidence was found only for reactive support (as originally defined in the HSE framework), *ie* no studies were identified which provided any evidence relating to the relationship between reactive support and outcomes. Some evidence was identified for all the other stressors.
- **Effect sizes:** The majority of effect sizes reported in the studies were either small or medium-sized. Taken as a whole, this indicates that the effects of single stressors on health, well-being, and organisational performance are not particularly strong. However, just as statistical significance does not necessarily imply practical significance, small effects sizes do not necessarily imply practical insignificance.

- **Cause and effect:** For review Questions 2, 3, and 4 only those empirical studies that were longitudinal in design were selected for review. This is because it is only possible to draw causal inferences (*ie* that a stressor caused some outcome) in such designs.
- **Measures used:** While both subjective and objective measures are important, and each have their strengths and weaknesses, much of the evidence reviewed here is based on subjective measures. Some of the existing limitations of stressor measures have been reviewed elsewhere (Rick *et al.*, 2001).
- **Multiple effects:** This review considered each of the review questions separately in relation to each of the nine stressor areas. However, what is apparent from both theory and the results of much empirical work is that many of these stressors are likely to interact with each other in sometimes complex ways. For example, the effects of one stressor such as workload may depend on levels of other stressors such as control, lack of support, physical environment, and so on. Some of the results reported here suggest that the combination of stressors is likely to have stronger effects than each of the stressors alone.
- **Theory:** From both practical and scientific perspectives, it is essential to know not only *that* stressors are related to certain outcomes but also *how* and *why* such relationships exist. In many cases is it not possible to simply remove or reduce a stressor, and more needs to be known about how and why the stressor is having its effects.
- **Differences across stressor areas:** One noticeable feature of the research findings is inconsistency of evidence across the nine stressor areas. This inconsistency relates both to the quantity of evidence, but also to the nature of the findings.
- **The non-cumulative nature of the evidence:** As indicated in the results sections, studies use different types of samples, methods, measures and time frames. Hence, even where results are relatively consistent, it is difficult to combine or add together the findings to produce a cumulative picture of the evidence. However, where consistency is found in results derived from different measures and approaches, this suggests stronger evidence that the relationships exist.
- **Differences in effects across outcomes:** One striking feature of these results is that stressors do not have uniform effects across the range of health and work-related outcomes measured. In other words, where effects of a stressor are found on outcomes, these often concern only some outcomes.
- **Differences between the review questions and the research questions addressed by researchers:** Most of the evidence gathered here comes from studies that were not designed or analysed to answer any of the four review questions. What this often meant, in practice, was extracting information and

results from papers that the authors of those papers did not choose to discuss or to focus on. It is worth noting, therefore, that this review is a review of evidence which for the most part was *not* collected in order to answer the kinds of questions posed here. This, in part, explains some of the limitations of the evidence in relation to the four questions.

## Conclusions

### Implications for practice

- The updating of this review on a regular basis in order that new evidence can be quickly assimilated and acted on.
- Clarification of what is still to be known on the basis of gaps in the review.
- The framework and the list of stressors developed by HSE for Phase 1 of the work need to be revised to reflect the complex way in which stressors impact on well-being.
- Any modification of the framework should also take into account the different outcomes related to various stressors as the relationships are not consistent.
- HSE should consider using existing good quality data sets to answer questions specifically related to the review.
- HSE should widely publicise its need for certain types of data, so that researchers in the process of designing and conducting work can build in measurement features that would ensure the data collected was more directly related to HSE's information needs.
- The nature of the limited evidence suggests that it is currently not feasible to issue clear and simple directives about which stressors are most harmful, at what threshold they become harmful, how they operate, or what can be done to reduce their levels. This does not mean, of course, that workable suggestions and advice cannot be provided about what is known and not known and what is likely to constitute good management practice around stress.

### Implications for research

- Further attempts to examine the proportion of the populations that are exposed to harmful or problematic levels of stressors would be useful, given the current lack of evidence. Prior agreement about the definition and measurement of threshold levels would be critical.
- As discussed above (section 1.6.1), one implication is that research needs to be conducted or existing data to be analysed in ways that will more directly address the questions HSE

wishes to answer. Some suggested means of doing this are discussed above.

- The scientific usefulness and validity of the general notions of 'stress' and 'stressors' has been questioned for some time – not because work conditions do not affect well-being, but rather because of the general non-specific nature of stress concepts. The results of this review and many other studies show quite specific links between types of work conditions and particular outcomes. For this reason, it may not be useful to label all aversive work conditions as 'stressors', when they may be very different from each other, operate in different ways, and have different effects. One research implication is therefore to attempt to further untangle the theoretical and empirical bases of these specific effects.
- A further research implication is that we lack good theories of the causal pathways between stressors and outcomes. While it is interesting to know that a particular stressor has some particular outcome, it is also important to know the processes through which that stressor has its effects. It is now time to move away from simple direct models (stressors cause outcomes) or moderated models (stressors cause outcomes depending on a third variable) to more complex approaches which attempt to understand how stressors have their effects or otherwise.
- The move towards more specific process-oriented approaches also emphasises the role of non-linear relationships between work conditions and various outcomes. Further research into such relationships promises to reveal more about where and when changes in stressors are likely to have their strongest effects.
- Given the present gaps in evidence, this may be an appropriate time to undertake a critical review of available theories which may help us to better understand how stressors and other work conditions have their effects on outcomes.
- Given the widely-varying timescales over which the longitudinal studies reviewed here have taken place, from months to decades, further thinking is required in order to design studies which, for example, capture the chronic and acute effects of stressors, and which are also capable of examining the ways in which people may adapt or adjust to increases in stressors.
- Additional research is required to both assess the validity of existing measures of well-being, and also to develop new techniques for assessing well-being in relation to work that are relevant to the management and control of psychosocial hazards.
- Future research could start to identify whether more participatory bottom-up approaches to risk identification and risk management are useful in this context.



# 1. Background and Introduction

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## 1.1 The HSE context

In 2001, The Health and Safety Executive (HSE) issued an invitation to tender for a project to provide a 'Review of Existing Supporting Scientific Knowledge to Underpin Standards of Good Management Practice for Key Work-Related Stressors (Phase One)' (see Appendix A for the Tender Specification).

The purpose of this project was to identify and review existing evidence relevant to the development of management standards. The Health and Safety Commission (HSC) had previously identified the development of such standards as a key aspect of its activities in the area of work-related stress. The HSE's intention was to do this in two phases, starting with the nine key stressors considered here as part of Phase One. Management standards are intended to 'help employers be clear about what is expected of them, allow them to monitor their performance in managing work-related stress, and thereby improve that performance' (Tender Specification, Appendix A).

## 1.2 The co-applicants' context

Researchers from the Institute for Employment Studies (IES) and Birkbeck College University of London, submitted a joint tender to undertake the review. The tender was accepted by HSE and this report describes the objectives, methods, and results of the review.

In general we adopt what is currently broadly described as an evidence-based approach and this review, where possible within the time and resource constraints, follows the approach and format of such reviews (see Clarke and Oxman, 2002<sup>1</sup>). It should be noted that evidence-based approaches are most dominant in medicine and allied health disciplines.

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<sup>1</sup> Clarke M, Oxman A D (eds) (2002), 'Cochrane Reviewers' Handbook 4.1.5'. (Updated April 2002) in *The Cochrane Library*, Issue 2, Oxford: Update Software (updated quarterly).



An evidence based approach is characterised by the use of systematic and explicit review process to rate the strength of scientific evidence in relation to specific research questions.

Given our approach, we were already aware to some degree of the strengths and weaknesses of some of the existing evidence in the field. While these strengths, and particularly the weaknesses, have been well-documented, there are relatively few, if any, systematic or semi-systematic critical reviews of the type commissioned and undertaken here. It is because of our evidence-based approach and the current gaps in knowledge that we were particularly interested in undertaking such a review.

## 1.3 Objective development and modification

The Tender Specification set out four objectives for the review:

**Review Objective A:** To review the available scientific knowledge on exposure to, and measurement of, the nine stressors.

**Review Objective B:** To review evidence about the effects of the nine stressors on health and well-being (and, where appropriate, organisational performance).

**Review Objective C:** To review evidence about the current understanding of the relationship between risk factor exposure and effect, together with, where possible, some indication of the proportion of the population where the effects are manifest.

**Review Objective D:** To review evidence about organisational activity which has been shown to reduce the impact of the nine stressors on health and well-being.

### 1.3.1 Further modification to the objectives and their reinterpretation as review questions

Following several discussions with HSE staff and the expert panel, the objectives were further modified over a number of iterations. These modifications were made in order to:

- **increase clarity:** Some objectives were insufficiently clear to allow a systematic and focused search of relevant evidence, or to identify how the objectives could be met.
- **change emphasis:** For example, in discussions it became apparent that the intention of Objective D was not actually to identify evidence about organisational activity that reduces the 'impact' of the nine stressors, but rather activities which reduce the level or presence of the nine stressors.
- **increase the fit of the objectives with existing literature:** In some cases it became apparent that parts of the objectives

could not be addressed given the nature of the existing literature, although important related questions could be.

- **remove potential overlap between the objectives:** For example, both Objectives A and C were both potentially concerned with the exposure to the nine stressors.

The modified objectives were then re-phrased as questions as is standard in literature reviews of this kind. The four questions the review sets out to address are detailed below.

In addition it should be noted that the initial general objective in the Tender Specification was to 'provide an up-to-date comprehensive and authoritative critical review and analysis of literature relevant to the four objectives and nine stressor areas. Given time and resources constraints, the words 'best available evidence' were included in this general objective to emphasise that the review would not focus on all available evidence of any type, but only the best available evidence.

## **1.4 The general objective of and the four questions addressed by this review**

The objective of the review is to answer the following four questions by providing an up-to-date, comprehensive and authoritative critical review and analysis of the best available evidence.

- Question 1: What proportions of the population are exposed to harmful levels of each of the nine stressors?
- Question 2: What are the effects of the nine stressors on health, well-being and organisational performance?
- Question 3: What are the mechanisms through which stressors have effects on health, well-being and organisational performance?
- Question 4: What organisational activities reduce the levels of each of the nine stressors, and what are the subsequent effects of this on health, well-being and organisational performance?

The evidence in respect of each of these four questions will be described in Chapters 3, 4, 5 and 6.

## **1.5 The evidence-based approach**

As indicated above, the general approach adopted here is an evidence based one. Evidence based approaches were developed in medicine and allied health fields as a systematic way of pulling together and assessing the quality of evidence around a given research question and making recommendations for practice. One difficult aspect of taking this approach is that often the available

evidence about any question is small in quantity, of poor quality, or inconsistent. This approach can to some extent be captured by the following taken from a medical context:

*'What are we to do when the irresistible force of the need to offer [clinical] advice meets with the immovable object of flawed evidence? All we can do is our best: Give the advice, but alert the advisees to the flaws in the evidence on which it is based'.*

Philips *et al.*, November 1998  
[www.cebm.jr2.ox.ac.uk/docs/levels.html](http://www.cebm.jr2.ox.ac.uk/docs/levels.html)

Therefore, this review will also alert readers to the extent and nature of the strengths and weaknesses in the evidence discussed here in relation to individual studies and the field more broadly.

## 1.6 Core team and expert advisor panel

The original tender proposal indicated that we would recruit an external expert advisor panel to work with the core team from the Institute for Employment Studies (Jo Rick, Louise Thomson, Hülya Hooker, Siobhan O'Regan, Claire Tyers), Birkbeck College (Rob Briner) and the University of Nottingham (Kevin Daniels).

The Expert Advisor Panel was asked to assist in:

- modifying review questions
- identifying relevant literature
- developing criteria for judging study quality
- checking of interpretations being made of study results
- commenting on final report structure
- reading and commenting on a draft final report.

In recruiting expert advisors, we chose individuals who have particular expertise and experience in relevant fields, and whose own work clearly indicates a critical approach to research, evidence and methodological issues. The panel consisted of the following people:

- **Ronny Lardner (The Keil Centre):** A Chartered Occupational Psychologist with considerable experience working with organisations to tackle work-related stress. He is also currently working with HSE on a project to develop organisation-specific management standards.
- **Associate Professor Sharon Parker (Australian Graduate School of Management, University of Sydney/University of New South Wales):** A well-established researcher in a number of fields including job redesign and stress. Has conducted empirical research and reviews for HSE.

- **Dr Kathy Parkes (University of Oxford):** Has extensive experience of longitudinal research into work related stress, psychosocial factors and health, and has particular interests in methodology and statistics. Her research has been funded by HSE for many years.
- **Professor Roy Payne (Institute of Work Psychology, University of Sheffield):** A very experienced researcher in the field of work stress, with particular interest in methodology and an extensive knowledge of relevant literature.
- **Dr Shirley Reynolds (University of East Anglia):** Experienced in conducting studies into work stress research and interventions. Is also a founder editor of the journal *Evidence Based Mental Health*, and has expertise in conducting and evaluating evidence based literature reviews.
- **Professor Peter Warr (Institute of Work Psychology, University of Sheffield):** Has been conducting studies of the relationships between work conditions (and unemployment) and well-being for many years and was formally the Director of the MRC/ESRC Social and Applied Psychology Unit.

## 1.7 General comments about process

In conducting this project and writing the review, the processes have been iterative, explicit, and open. In developing the criteria for judging the quality of evidence, for example, each set of criteria was initially developed by one member of the core team, discussed and revised amongst the core team, and then sent to the expert advisor panel for further comment and revision. These were then shown to HSE staff for further comment and revision. Full details of the methodology and process are given in Chapter 2.

At every stage of the review we have therefore attempted to ensure that what is produced in the final report not only clearly meets the aims and objectives of the project, but also that the views of the Core Team, Expert Advisor Panel and HSE Staff have been represented and contributed to the processes through which the final report was produced. Ultimately, though, this project aims to provide an accurate review of the best available evidence capable of addressing each of the four review questions.

It should also be noted that the explicit and systematic nature of these processes and methods is intended to ensure that any other persons wishing to review this same literature would be able to repeat the process and draw the same or broadly similar conclusions. Given time and resource constraints, it is possible that some key pieces of evidence have been omitted, or errors have occurred. The authors would be grateful if readers could inform them of any such omissions or errors.



## 2. Methodology

The HSE undertook a scoping exercise, the purpose of which was to describe the elements of jobs that the HSE should take into consideration when developing management standards. The proposed standards are divided into six broad areas (Demands; Control; Support, Training and the Individual; Relationships; Role; and Change). Within each of these broad areas there are a number of more specific potential 'standards'. Of these, nine were selected by the HSE to be studied in this review. Full details of the outline can be found in Appendix A.

The aim of this review was to identify the best available evidence for the four review questions for each of the nine stressors identified by HSE for this part of the review. In essence the task was to find the best available evidence for each of the cells in Table 2.1 and map it onto the framework.

**Table 2.1: Nine work stressors by four review questions**

	Four review questions			
	(A) What proportions of the population are exposed to harmful levels of each of the nine stressors?	(B) What are the effects of the nine stressors on health, well-being and organisational performance?	(C) What are the mechanisms through which stressors have effects on health, well-being and organisational performance?	(D) What organisational activities reduce the levels of each of the nine stressors, and what are the subsequent effects on health, well-being and organisational performance?
<b>Nine stressors</b>				
1) Poorly designed/managed workload				
2) Poorly designed/managed work scheduling				
3) Poorly designed/managed work design				
4) Poorly designed/managed physical environment				
5) Lack of skill discretion				
6) Lack of decision authority				
7) Lack of appropriate proactive support				
8) Lack of appropriate reactive support				
9) Poorly designed/managed procedures for eliminating damaging conflict at individual/team level (bullying/harassment)				

Source: IES 2002

A key task for the researchers was to ensure that the work was conducted in a way that was as free from bias as possible. Previous research in this area (eg the psychosocial hazards research<sup>1</sup>) has highlighted the need for explicit, transparent criteria to be developed for literature reviews. As such, it was essential that the methodology made the process of identifying and reviewing evidence both explicit and objective. As a result, the review was conducted with strict adherence to predetermined criteria for assessing published work. These are discussed in sections 2.2.4 and 2.3.4. These criteria should reflect generally agreed standards within research, and should be developed in line with the specific aims and objectives of the project. It must also be possible to demonstrate that these criteria are applied by the researchers in a systematic way. This ensures that the review process is as free from bias as it is possible to make it, and that any other researchers conducting the same task with the same criteria would achieve pretty much the same results.

The methodology involved four main stages, each building on the previous one. Each stage involved a number of activities and processes, for which various supporting structures were developed. As indicated earlier, at each stage the expert advisers were consulted.

In this chapter, the structures and processes involved in completing this review are described by discussing each stage in detail. These stages were:

- identification of the literature for review
  - identification and collection of key literature
  - development of bibliographical database
- sifting the literature against relevance criteria
  - developing inclusion and exclusion sift criteria based on the relevance of the articles to the review questions and minimum quality criteria
  - piloting of sift criteria and agreeing sift proforma
  - conducting the sift of the identified literature
- reviewing the relevant literature for evidence
  - development of review criteria for assessing the evidence for each of the nine stressors against the review questions
  - piloting of the review criteria and agreeing query protocol
  - training of reviewers in use of the review criteria
  - conducting the review of articles, recording details of sampling, design, analysis and results on a database

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<sup>1</sup> Rick, Briner, Daniels, Perryman and Guppy (2001), *A Critical Review of Psychosocial Hazard Measures*, HSE Books.

- analysing the review results
  - analysing and summarising evidence by stressor and review question (review questions A, B, C, D)
  - gather feedback on headline findings from expert advisors.

## 2.1 Identification of literature for review

### 2.1.1 Scale of the relevant literature

A key issue identified at an early stage in the project was the breadth of potentially relevant literature and the need for an efficient method of extracting the best evidence in relation to the nine HSE stressor areas and four review questions.

In principle, the review could draw upon a very large body of literature, although it was felt that studies which provided evidence relevant to review questions B, C and D (*ie* providing evidence of impact, establishing causality and organisational interventions for each of the stressor areas) would be likely to be drawn from only a small range of papers. The conventional way to identify the relevant papers would be through keyword searches on databases such as Web of Science, Medline and Psyclit. However, experience from undertaking previous reviews<sup>1</sup> suggested that undertaking a review using such an approach would be a large and costly task, even for just one of the nine stressor areas. It is not the subsequent or final number of relevant articles which poses the problem. Rather, so common are articles about stress, that it is almost impossible to conduct a very focussed search using keywords on electronic databases without generating many thousands of articles. It is the sifting out of redundant material that takes a large amount of resource.

Given the timescale and budget for the research and the requirement to focus on the best available evidence, a more parsimonious route to identification of relevant literature was sought.

The fact that the literature relating to review questions B, C and D is relatively small, was in fact an advantage in this context: the literature was limited enough to be known by experts in the field., This review therefore used an expert panel to identify what was considered to be the best evidence to include in the review. As indicated earlier, advisors were chosen on the basis of knowledge of the literature relating to the nine stressors. They therefore acted as an authoritative source of information about relevant articles for each of the nine stressor areas and in relation to each of the review questions. The search was then supported through

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<sup>1</sup> Rick, Briner, Daniels, Perryman and Guppy (2001), *A Critical Review of Psychosocial Hazard Measures*, HSE Books.



keyword searches of electronic databases for more recent years to ensure the review was fully up to date, and was further supplemented by writing to researchers who are active in the relevant areas to seek their advice in identifying any further sources. Through the use of these multiple methods of identifying the literature, the risk of omitting any key studies would be minimised.

### **Initial consultation with expert advisors**

Following initial discussions with expert advisors, a briefing document was circulated to all seven advisors in October 2001, which outlined the context of the project and included the matrix of stressors by review questions (see Table 2.1).

Expert advisors were asked to identify for each cell the best evidence available, looking beyond published articles and books and including unpublished literature and providing the names of researchers or research groups that should be contacted. The advisors were also asked to indicate to which parts of the matrix each article refers and in many cases a single study was relevant to several cells. In addition, the advisors were asked to indicate these parts of the matrix for which they could not identify any relevant literature.

### **Contact with other researchers active in the area**

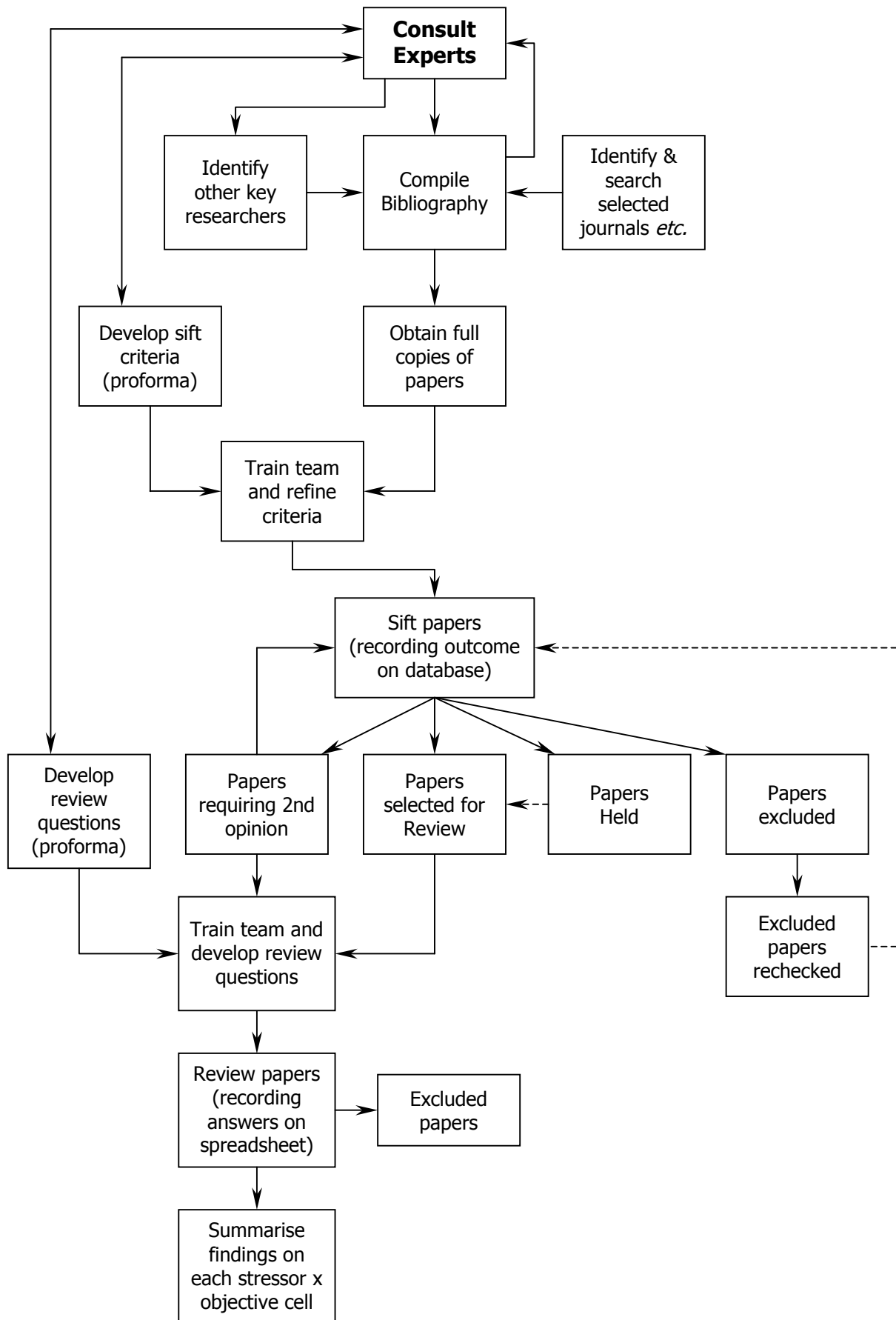
The expert advisors identified 12 key researchers in the area. These researchers were contacted by e-mail, introducing the project, informing them of publications already identified and asking them for the references for other relevant published or unpublished evidence. This request was followed-up by two reminders where necessary. From this process further literature was collected from:

- J Barling
- M Frese
- P A Landsbergis
- T Wall
- M G Marmot.

### **Supplementary search for recent journal articles**

A supplementary search for recent journal articles and publications was conducted to ensure an up-to-date bibliography. The team identified seven journals which were key sources of articles on work related stressors, the journals reviewed here are all internationally recognised and refereed:

Figure 2.1: The review process



Source: IES 2002

- Academy of Management Journal
- Journal of Applied Psychology
- Journal of Occupational Health Psychology
- Work and Stress
- Journal of Occupational and Organizational Psychology
- Journal of Organizational Behavior
- British Journal of Health Psychology.

Recent volumes of these journals (Spring 2000 to Spring 2002) were hand-searched for potentially relevant articles.

In addition, the publications list of both the HSE and NIOSH (USA's National Institute of Occupational Safety and Health) were examined for relevant articles.

### **An iterative process**

The compiled bibliography was circulated to the expert panel with a request for additional evidence omitted from the list. Further items were then added to the database, and the updated bibliography was circulated again. The growing bibliography was circulated to the group of experts a number of times asking them to check for omissions.

### **Retrieval**

A full copy of each new paper or book was sought for the next stage of the reviewing process. Progress of the retrieval process was recorded on the project database (see below). As articles were obtained, they were marked with unique identifying numbers, and archive copies made where permitted by Copyright Licensing.

#### **2.1.2 Bibliographical database**

A fully searchable database was designed to record references and their progress through the review process. This made it possible to search for each new reference on the database before entering it, ensuring that only one copy of each recommended paper was retrieved. The software automatically provided each paper with a unique identifying number.

## **2.2 Sifting the literature for review**

This stage of the method involved making an initial assessment of the relevance and quality of each paper. It identified which papers would go on to be thoroughly reviewed for the next stage of the project.

### 2.2.1 Developing sift criteria

Sift criteria were developed to allow judgements to be made about whether individual papers should be excluded or included in subsequent stage of the main review.

The sift criteria were developed through consultation with the expert advisors and from drawing on existing accepted standards about what constitutes evidence in relation to the specified objectives for the research.

The sift criteria asked three basic questions of each paper:

1. Does the study contain data relevant to the nine stressor areas?
2. Does the study contain data relevant to the four review question areas?
3. Does the paper meet the minimum quality criteria for inclusion in the review?

#### Relevant data

In order for any paper to be included in the subsequent review, it had to provide specific information on at least one of the listed stressor areas and at least one of the four review questions. If the paper did not contain information relevant to the review, then it was excluded from the remainder of the project.

#### Minimum quality criteria

Those papers that did contain relevant information also had to meet criteria regarding the quality of the research to be included in the review. These minimum quality criteria had to be relatively complex to take into account the variety of research types. Two sets of criteria were developed: one for meta-analyses and literature review papers, and one for empirical papers.

If the paper was a **meta-analysis or literature review**, it had to give a clear account of its method (*eg* the search method used to identify the literature, the inclusion criteria, the meta-analysis methods used *etc.*).

If the paper was an **empirical paper relating to review questions B, C, or D**, the study had to be a randomised controlled trial, a full field experiment, a quasi-experimental design or a longitudinal study in order for it to be put forward for review. These designs were included, as they allow inferences to be made about causality. If a paper used a cross-sectional design, it was put into a 'holding' category, to be reviewed if no evidence from experimental or longitudinal studies was found. In addition, the sample had to be either a randomly drawn representative sample of the general population, or a full population, random or

stratified random sample drawn from a specific population (eg an organisation). These samples were included, as they allowed inferences to be made about the generalisability of the findings. If another sampling method was used (eg purposive, other non-random) or the method was unclear, the paper was excluded.

If it was an **empirical paper relating to review question 1**, it could also be included if was a cross-sectional survey of a general population with a sample size greater than 667.<sup>1</sup> The sample had to be a randomly drawn representative sample of the general population.

Initially, empirical papers were only put forward to the main review if the research used a working sample of UK adults. However, due to the relatively low volume of research based on UK samples, and the amount of good quality evidence from other countries, an early decision was taken to include all working adult samples and to record origin of sample.

### **2.2.2 Piloting the sift proforma**

These criteria were written down to form two paper sift proformas to:

- sift empirical data
- sift meta-analyses and literature reviews.

The sift proformas were piloted on a small number of papers and amended accordingly. The final version of the two sift proformas can be found in Appendix B.

Although the proformas were generated as a means of achieving an end (in this case an unbiased review) it should be recognised that the proformas are a valuable output of the project in their own right. For example, the proformas could be used by the HSE in future evaluations of research in this area, or could be used as training tools to train those involved in evaluating commissioned research. The proformas have been rigorously developed and validated, and provide a flexible tool that can be used to guide future research assessment, evaluation or tender specifications.

### **2.2.3 Using the sift proforma**

A proforma was completed for each of the papers and the sift results stored on the bibliographical database.

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<sup>1</sup> A sample of this size allows a 99 per cent confidence interval of .1 of a standard error around the population mean. Hays, W L (1998), *Statistics*. New York: Holt Rinehart and Winston.

Based on the sift criteria, every empirical paper going through the sift process was placed in one of four categories:

- excluded
- to be reviewed
- on hold
- second opinion required.

A paper that did not provide information about relevant stressors, did not address any of the four review questions, or did not meet the minimum quality criteria, was excluded from the remainder of the project.

If a paper provided evidence on one or more of the nine stressors that was relevant to one or more of the review questions, and met the minimum criteria described above, then it was to be reviewed in the next stage of the project.

For review questions B, C, and D, some papers were identified that provided relevant evidence in terms of the stressors, but used cross-sectional designs. These studies were put into a 'holding' category, to be reviewed if no evidence from longitudinal studies was found.

If a researcher was unsure as to the sift decision for a paper, he or she indicated that a second opinion was needed and the paper was allocated to a second researcher.

For every meta-analysis or literature review going through the sift process there were three categories they could be placed in:

- excluded
- to be reviewed
- second opinion required.

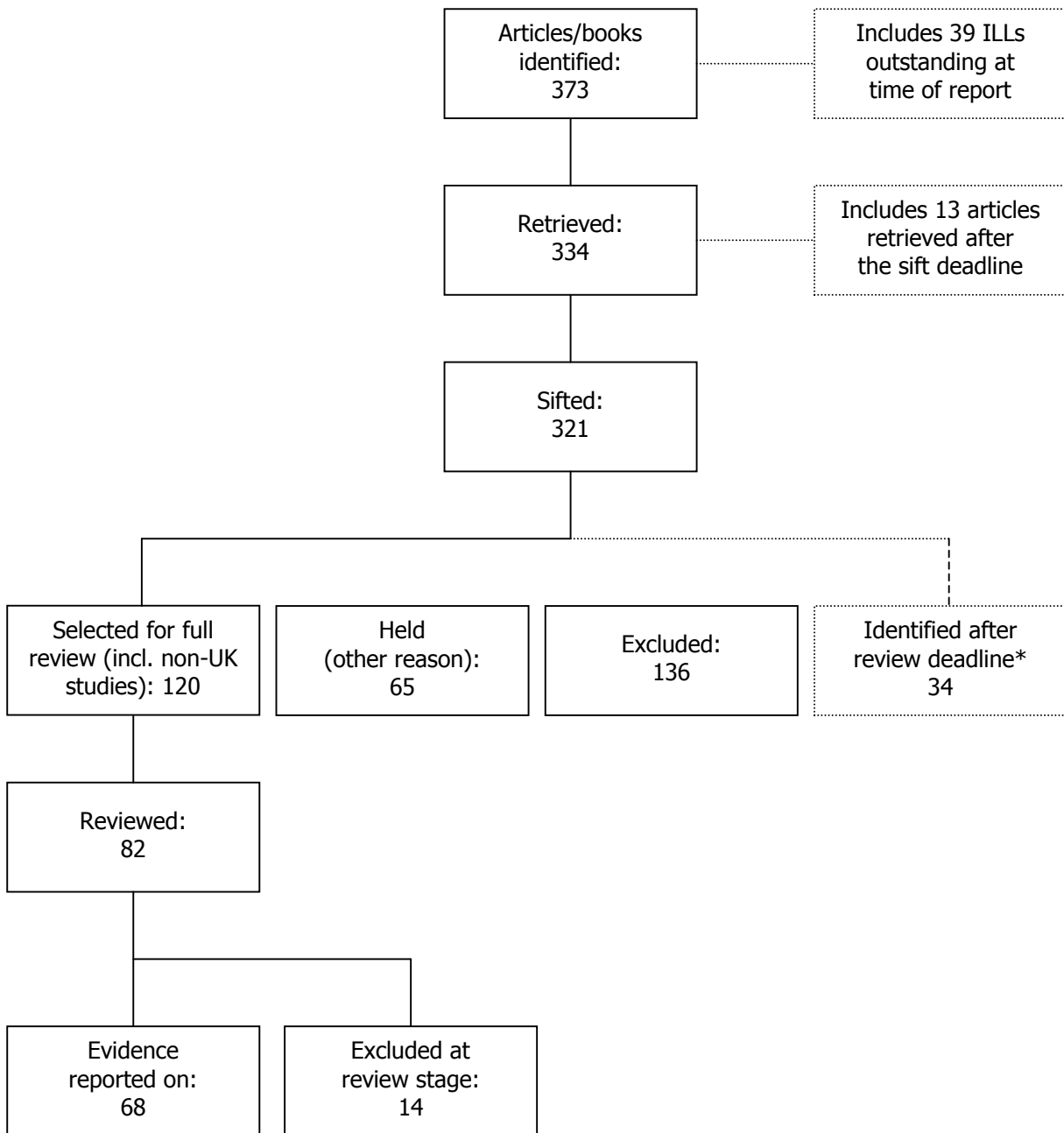
Following the sifting stage, selected information from the proforma was entered on the database. This procedure provided the research team with some basic information on all the literature, including papers which were excluded or put on hold.

The paper was then either:

- allocated to a researcher for second opinion, or
- allocated to a researcher for reviewing, or
- if it was not to be reviewed (excluded or held) it was filed appropriately.

As a final check, at the end of the reviewing process, all papers that had originally been excluded or put on hold were rechecked against sift criteria. Four additional papers were identified for review in this way.

**Figure 2.2: Number of articles identified at each stage of the review process**



\* After the review deadline, additional relevant information was identified. Although too late for inclusion in the review the articles were sifted to give an indication of the extent of further evidence that might be available (see Appendix C)

Source: IES 2002

## 2.3 Review of articles

### 2.3.1 Developing review criteria

Review criteria were developed to extract the detailed findings for each stressor/review question combination. Again, these criteria were developed through consultation with the expert advisors and from drawing on existing accepted standards about what

constitutes evidence in relation to the specified objectives for the research.

Different review proformas were developed for empirical studies and for meta-analyses/literature reviews.

The proforma for empirical papers asked reviewers to extract the following details for each paper:

- Sampling
  - sample origin
  - sampling procedure
  - statistical checks on the representatives of the sample
  - testing for response bias
  - sample size and response rate
- Measures
  - name or description of stressor measures
  - name or description of outcome measures
  - reliability of measures
  - validity of measures
  - time of measurement
- Design
  - rationale for the design used
  - specific features of the design
- Analysis
  - type of analysis
  - variables controlled for
  - subject to variable ratio
- Results
  - main findings
  - effect sizes
  - statistical probabilities
- Research source
  - who commissioned the research
  - who conducted the research.

The proforma for meta-analyses and literature reviews asked reviewers to extract the following details for each paper:

- Literature identification



- sources of literature
- search criteria
- number of papers identified
- inclusion criteria
- final sample size (papers and participants)
- Analysis
  - corrections and checks conducted
  - moderators
- Results
  - number of samples/participants
  - correlation coefficient
  - confidence intervals or significance
- Research source
  - who commissioned the research
  - who conducted the research.

Results were recorded on two Excel databases developed for the purpose: one for meta-analyses and one for empirical studies. This facilitated the sorting of papers by various fields. Results relevant to each of the stressor/question cell could then be extracted, in turn, for analysis.

### **2.3.2 Piloting the review proforma**

Both review proformas were piloted by the research team. The expert advisers were also asked to comment on the proformas as they developed. Some minor adjustments were made to clarify the proformas. The final versions of the review proformas are also available in Appendix B.

### **Team training**

To ensure consistency of approach, a workshop was run for the reviewers by the project manager. The aim of this session was to deal with any queries and to develop the protocol for tackling issues as they arose during the review.

Finally, three papers were selected, and each member of the IES research team reviewed the papers separately. The inter-rater reliability was calculated and showed a high level of agreement. Any areas of disagreement we discussed within the team and resolved prior to the reviews being completed.

### **2.3.3 Using the review proforma**

Papers identified for review were allocated to individuals from the research team. At this stage, papers went through a second check against the sift criteria, and 15 further papers were excluded from the review. The paper was then reviewed in terms of the appropriate proforma and the information recorded on the bibliographical database.

During the reviewing stage, regular meetings were held to deal with any queries or questions from the reviewers.

## **2.4 Analysis and summarising of evidence by stressor and review question**

Once reviews were complete, data were tabulated for each of the cells in the original matrix.

Some papers were concerned with stressors that did not map precisely onto the nine specified by the HSE. Proactive and reactive support (as in the HSE framework) were rarely distinguished from each other, but instead the research was concerned with support generally. Therefore, these two stressors were grouped together to form a general (lack of) support stressor.

In order to be as inclusive as possible, two additional categories were added for 'other forms of demand' and 'other forms of control'. These categories captured any stressors that were relevant for the review but did not quite match the definition of stressors provided by the HSE.

Supporting information was drawn from the database to describe the evidence available for each of the stressor areas in relation to each of the review questions, and each cell described individually.

## **2.5 Introduction to the review results**

This section describes the format of the review results and comments on some of the methodological and design issues from the studies that were reviewed. It summarises these issues and comments on their implications for the review.

### **2.5.1 Format of the review results**

The review results form a complex matrix of information, addressing as they do four different questions for each of the nine stressors. This information could be reported in a number of different formats, each of which has various merits. We have chosen to break down the results initially by review question (A, B, C, and D), with the next four chapters, reporting the results for

each question. Within each chapter, the results are then presented by each of the nine stressors in the order they are listed in Table 2.1.

### **2.5.2 Outcome measures**

The reviewed studies used a wide variety of different outcome measures to assess the impact of stressors. The majority of studies measured multiple outcomes using self-report methods. In this report, and particularly in Chapter 4, the different outcomes have been divided into two categories for ease of presentation. The first category contains work-related outcomes such as job satisfaction, organisational commitment, intention to leave, absence, and job performance. The second category contains affect and health outcomes such as mental health, physical health, heart disease, blood pressure.

It is important to note that whilst we have distinguished these two categories for ease of presentation, the work related outcomes can overlap with mental health. For example, job satisfaction is an important work outcome linked to organisational effectiveness (Judge *et al.*, 2000). However, it is often also considered an indicator of well-being and mental health.

### **2.5.3 Objective and subjective measures**

The majority of studies measured both stressors and outcomes through the self-report of participants (*ie* subjective measures). They used either published scales, adapted scales or *ad hoc* scales designed for the study. As widely acknowledged, sole use of self-report scales alone can lead to problems of common method variance and produce inflated associations between variables.<sup>1</sup> Only a few studies took objective measures for either stressors (*eg* hours worked, shift pattern) or outcome measures (*eg* absence, performance measures, blood pressure). The tables of results in Appendix C show which measures were subjective (*ie* self-report) or objective (*ie* reports from records), where this information was available. In assessing the overall quality of the studies, it is not so much their objectivity or subjectivity *per se* that is most important, but the appropriateness of the measure, given the construct it claims to represent.

### **2.5.4 Sampling**

The sample used by any study may limit the validity and generalisability of the findings. The sampling frames were usually a specific occupational population such as a single organisation, a

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<sup>1</sup> Campbell D T, Fiske D W (1959), 'Convergent and discriminant validation by the multi-trait-multimethod matrix', *Psychological Bulletin*, 56, 81-105

building or plant, a department or team, or a single occupation or grade. Furthermore, sample sizes varied enormously and were often reduced by sample attrition over the length of a study. The use of small samples can increase the chance of type II error (failing to demonstrate an effect when there is one), whilst unequal group sizes can reduce the power of analyses. The sample size of each study and meta-analysis (both in terms of number of samples and total sample size) is indicated in the results tables in Chapter 4.

### **2.5.5 Designs**

As discussed in section 2.3.2, the review focused on longitudinal studies and meta-analyses. Although a variety of possible longitudinal designs are possible, single-sample longitudinal or cohort studies were by far the most commonly used. There are a number of key features of longitudinal designs by which the quality of studies can be assessed:

- controlling for baseline measure
- presence of an appropriate comparison or control group
- appropriate time periods.

Baseline measures allow prior differences between individuals and groups to be assessed and controlled in the statistical analysis. If they are not measured or adequately analysed, alternative explanations for the results cannot be excluded. To address this, the tables of results in Chapter 4 indicate which studies measured and analysed baseline measures for the outcome (Y) and which did not (N).

The use of comparison or control groups in some longitudinal designs allows the testing of the effect of a stressor by comparing a sample who were exposed to the stressor with a sample who were not. A small number of studies adopted such quasi-experimental designs and made between-subjects comparisons. The nature of the control or comparison group used is detailed in the results tables in Chapter 4 where applicable. However, there are various practical and ethical difficulties associated with identifying appropriate comparison groups, and the vast majority of studies used a single sample which was followed over time. Such studies made comparisons between naturally occurring differences, such as differences in self-reports of stressors and outcomes over time.

The studies showed considerable variation in the length of time that they covered. Whilst some effects of stressors or interventions may only become apparent after a long period, others may be short-lived, and require a very short follow-up of a matter of hours or days. It is therefore important to measure the effects of the stressor or intervention at an appropriate time, where possible

assessing outcomes at multiple time points, both long- and short-term. Information on the timeframe for each study is indicated in the tables of results in Chapter 4.

It is clear from the above, and has been widely acknowledged elsewhere, that there are difficulties associated with applying traditional experimental designs to study work-related stress and interventions designed to reduce their impact. These difficulties are reflected in the designs used by the studies reviewed in this report, which were dominated by single sample longitudinal approaches.

A few alternative approaches were found that offered greater opportunities for understanding the effects of the stressors whilst overcoming some of the difficulties above. For example, diary studies<sup>1</sup> allowed the collection of baseline measures and multiple data points at short-time periods, and could be analysed to draw within-subject comparisons and to allow the dynamic nature of effects to be seen. The study of work-related stress takes place in dynamic and complex organisational contexts, where organisational stability and control is unrealistic. Diary studies and other approaches may offer more potential for studying work-related stress in these contexts. On the other hand, diary studies have their own limitations, such as small samples and possible adjustment of perspectives after repeated responding.

### **2.5.6 Intervention studies**

In addition to the design issues described above, intervention studies have further difficulties associated with their design. The HSE-funded review of organisational interventions to reduce stress (Parkes & Sparkes, 1998<sup>2</sup>) has discussed these in some detail, and they include:

- finding appropriate comparison groups
- isolating an intervention to one group
- controlling for unintended effects of interventions.

Most of the interventions reviewed in this report were broad-ranging work design changes or were aimed at addressing multiple factors, not specific stressors. As a result, implications for single stressors are often unclear. In addition, many interventions had previously not established that there were in fact problems with the stressors they aimed to reduce. This is likely to have implications for the subsequent effectiveness of the interventions.

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<sup>1</sup> eg Teuchmann K, Totterdell P, Parker S K, (1999); Sonnentag S (2001).

<sup>2</sup> Parkes K R, Sparkes T J (1998), *Organizational Interventions to Reduce Work Stress: Are They Effective? A Review of the Literature*, Health & Safety Executive, Contract Research Report 193, HSE Books

## 2.5.7 Effect sizes

Different effect size statistics are reported by the studies. These include  $r$  (from cross-lagged correlations or a correlation matrix of a structural equation model),  $R^2$  (from ordinary least squares regression), and odds ratios (OR) and rate ratios (RR) (from logistic regressions). Those need to be interpreted differently, as they indicate slightly different relationships.  $R^2$  indicates the percentage of the outcome measure that was due to the effect of the stressor (*eg* if  $R^2=.23$ , then 23 per cent of the variance in the outcome is predicted by the stressor). Odds ratios and rate ratios indicate the increased risk of the outcome for those exposed to the stressor, compared to those not exposed to the stressor (*eg* if  $OR=1.75$ , then those people exposed are 1.75 times more likely to experience the outcome than those people who are not exposed).

Many studies did not report appropriate effect size statistics, either presenting other statistics, such as Beta coefficients in regressions, or reporting effect sizes for combinations of stressors only. Where effect sizes were reported for the relationship between a single stressor and an outcome, these are reported in the tables of results in Chapter 4. If the relationship between a single stressor and an outcome was statistically significant ( $p<.05$ ) but no effect size was reported, then this is also indicated in the 'effect size' column of the results table.

This report has used the conventions from psychological research when considering effect sizes, *ie* an  $r$  of  $.6/.7$  is large,  $.3$  is small. However, we recognise that context is critical in interpreting these results. A large number of people exposed to a small risk may generate many more 'cases' than a small number exposed to a high risk. For example, a RR of 1.12 in a population of nurses or all employed people has huge implications, especially if the variable is associated with morbidity.

## 2.5.8 Double-counting

Double-counting may affect the overall results of any review. It may arise from two sources:

- including the results of a study both from an empirical paper and from a meta-analysis in which that paper was included
- including the results of one study that has been published in a variety of different papers or reports.

To assess the degree of double-counting, different papers that are based on the same study and sample are identified in the results.

The following four chapters describe the results in full.



# 3. Review question 1: Evidence of Exposure Rates or Incidence Rates

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This section describes the findings in relation to the first review question. The HSE specified four questions to be addressed by this review. The research team reviewed the available research with a view to identifying and assessing:

- what proportions of the population are exposed to harmful levels of each of the nine stressors.

Of the four review questions outlined by the HSE, question A is notably different from the other three. While questions B, C and D are concerned with understanding the impact of the stressor at the individual level and what can be done to eliminate or manage the stressor at an individual or organisational level, question A is more concerned with measuring the magnitude of the problem at the national level. While some stressors may have a huge impact on a small number of people, other stressors may have a small effect on a large proportion of the population. The review therefore covers both the size and intensity of the problem associated with each stressor. Both types of information are necessary for prioritising management action.

## 3.1 The scale of the problem

The HSE report that:

*Stress-related problems are the second most commonly reported cause of occupational ill health, after musculoskeletal disorders. It is thought that stress-related ill health accounts for about 20 per cent of reported cases of occupational ill health (about 500,000 cases) and that about 92,000 new cases occur each year. It is estimated that this results in 6.5 million working days lost, at a cost to society of about £3.7 to £3.8 billion (1995/96 prices). In a CIPD survey of employers, stress was ranked second (after minor illnesses such as colds, flu, stomach upsets etc.) as the main cause of absence for non-manual workers.*

from HSE original invitation to tender

Other estimates have varied. For example, Kearns (1986) estimates 40 million days are lost each year to stress-related disorders. While the numbers vary, there seems little doubt that stress at work is perceived as widespread and that it is a commonly



reported cause of ill health and absence. Chapters 4 and 5 report on the evidence of the causal links between stressors and ill-health. But what of the prevalence of the individual stressors?

Once the review process began, it became apparent that the amount of evidence readily available to address question A was much less than that for the other questions. Indeed, using the chosen methodology, only one paper from a peer reviewed journal was identified as providing information on the exposure or incidence rates to the specific work related stressors of interest to the HSE in the general UK population. This may initially seem surprising, but a closer look at the often-quoted stress prevalence figures confirms the finding. Such figures do not consider specific work related stressors, but rather tend to measure stress with generic questions, as this example from the Labour Force Survey demonstrates:

- Do you suffer from stress, anxiety or depression? and
- Is that condition caused or made worse by work?

### **3.2 The Bristol *Stress and Health at Work* study**

The most valuable source of information for review question 1 is a study commissioned by the HSE in 1998, 'Bristol Stress and Health at Work', which aimed to:

- determine the scale of perceived stress at work in a random sample of the population
- distinguish the effects of stress at work from those of stress in life as a whole
- determine whether measures of health status and performance efficiency were related to report of stress at work.

The study is one of only a few random sample surveys containing questions relevant to the stressors identified in the HSE framework. The sample of 17,000 respondents was drawn from the Bristol electoral register.

It should be noted that the Bristol study is based on self-report data. It does not, therefore, offer objective evidence of stress levels, rather it provides insight into how employees perceive their work.

The second aim of the Bristol study – to distinguish work stress from life stress – is unique amongst such studies and has proved particularly useful in addressing review question 1.

Two reports of this study were identified in the course of the review:

- Smith A (2001), 'Perceptions of Stress at Work', *Human Resource Management Journal*, Vol. 11, No. 4, pp. 74-86

- Smith A, Johal S, Wadsworth E, Davey Smith G, Peters T (2000), *The Scale of Occupational Stress: The Bristol Stress and Health at Work Study*, Health & Safety Executive, Contract Research Report 265, HSE Books.

Although both articles were retrieved and selected at the sift stage, it was decided to fully review only the more comprehensive contract research report. The project was actually a longitudinal study providing evidence of relevance to review question 2. However, this section presents the relevant extracted results in relation to each of the nine stressors below.

The results show that workload is the work stressor that is reported as affecting the largest proportion of the population. Physical environment, bullying/harassment, and lack of proactive support are reported as affecting a much smaller proportion of the workforce. These results are described in more detail below, and are supplemented by UK statistics taken from the Third European Survey of Living and Working Conditions (Paoli and Merllié, 2001). This survey was conducted in all EU countries, has a fairly small sample of 1,500, and includes employees and the self-employed. The results of the survey based on the total EU sample are described in section 3.2. Unless otherwise specified, the percentages below are from the Bristol study.

### **3.2.1 Workload**

The Bristol study found that 86 per cent report that they often or sometimes have to work very fast and 85 per cent report that they have to work intensively often or sometimes. Forty per cent report feeling that they seldom or never had enough time to do everything and 57 per cent report that they experience constant time pressure due to heavy workloads.

The Third European survey found 25 per cent of workers in the UK report having to work continuously at high speed.

### **3.2.2 Work schedule**

The Bristol study found that 34 per cent perceive themselves to work unpredictable hours often or sometimes, 43 per cent perceive themselves to work long or unsociable hours often or sometimes, 60 per cent feel that they seldom or never have enough time to do everything, and 40 per cent feel that they can seldom or never have flexible working time.

The Third European survey found 52 per cent of UK employees reported themselves to have influence over their working hours, and 22 per cent say they do night work at least once a month.

### **3.2.3 Work organisation and job design**

No questions relevant to this work stressor were included in the Bristol Stress and Health at Work study.

### **3.2.4 Physical environment**

Twenty-five per cent said they were 'often, sometimes or ever' required to handle or touch potentially harmful substances, and a similar proportion reported that they were often or sometimes exposed to breathing fumes, dust or other harmful substances. Seven per cent reported they had work tasks that left them often, sometimes, or ever with ringing in their ears or temporary deafness, and 24 per cent say they often or sometimes work in an environment where the level of background noise disturbs their concentration.

### **3.2.5 Skill discretion**

Eighty per cent of workers said they often or sometimes had to do the same thing over and over again. At the same time, 83 per cent of respondents felt that their work often or sometimes demanded a high level of skill or expertise, while 17 per cent describe their jobs as seldom or never providing a variety of interesting things to do.

### **3.2.6 Decision authority**

The Bristol survey asked a number of questions about workers' perceived degree of decision authority and found that:

- 75 per cent of workers report they have others taking decisions concerning their work often or sometimes
- 17 per cent seldom or never feel that they have a choice in deciding how they did their work
- 23 per cent seldom or never feel that they have a great deal of say in decisions about their work
- 41 per cent seldom or never report that they have a choice in deciding what to do at work
- 21 per cent seldom or never feel in a position where they have a say in work speed
- 27 per cent say they can seldom or never decide when to take a break
- 19 per cent have the experience that they can seldom or never take holidays when they wish
- 65 per cent say they seldom or never have a say in choosing who they work with

- 53 per cent perceive that they seldom or never have a great deal to say in planning their work environment.

### **3.2.7 Lack of support**

The questions in the Bristol survey did not particularly distinguish between proactive and reactive support (as defined by the HSE). In terms of support generally:

- 23 per cent feel that they seldom or never got enough help or support from their immediate manager
- 13 per cent feel that they seldom or never got enough help or support from their colleagues
- 18 per cent have immediate managers who they perceive as seldom or never willing to listen to their work problems
- 14 per cent have colleagues who they perceive as seldom or never willing to listen to their work problems
- 24 per cent feel that they don't experience adequate support in difficult situations.

### **3.2.8 Bullying/harassment**

Bullying and harassment affects a much smaller proportion of the working population overall than the other work stressors, though the total figures probably hide huge occupational variations. In the Bristol study two per cent of workers reported that they had experienced racial abuse, three per cent reported experiencing sexual harassment and seven per cent felt they had been bullied.

The European study, however, found a much higher proportion of workers reported that they had been subjected to intimidation (14 per cent).

## **3.3 Additional information sources**

In addition to the Bristol study, the review process identified a number of papers that provided some peripheral information. The evidence in these papers is not ideal, but they supply some supporting findings. For example, national surveys conducted in other countries can provide an indication of prevalence in other cultures.

### **3.3.1 Evidence from other countries**

#### **The Netherlands**

Houtman *et al.* (1994) conducted some secondary analyses of the National Work and Living Conditions Survey, a large representative sample of the working population of the

Netherlands. These researchers summarised the findings across three years 1977, 1983, and 1986. In this survey, respondents were asked a number of questions about their working conditions. Again, this is self-report data, so represents perceptions of the workplace not objective evidence about its state. This survey indicated that 42 per cent report experiencing a high work pace. In terms of job demands, this finding is consistent with the results of the questions asked in the Bristol survey. Also consistent with the Bristol survey, stressors from the physical environment of the workplace are reported as affecting a smaller proportion of the population:

- 24 per cent reported being involved in dirty work
- 10 per cent said they experience a bad smell at work
- 25 per cent reported experiencing noise at work
- 9 per cent say they do dangerous work
- 22 per cent report carrying a heavy physical load.

This survey also found that 17 per cent of the Dutch working population report that they do monotonous work.

### **The European Union**

Paoli and Merllie's (2001) report on the third European survey on working conditions 2000 (sample of employees and self-employed people in the EU), contains some questions on workload, work scheduling, physical environment and decision authority. The relevant results are summarised below:

- Workload
  - 56 per cent report working at very high speed for at least one quarter of their working hours
  - 60 per cent report working to tight deadlines
  - 21 per cent feel that they do not have enough time to do the job.
- Work scheduling
  - 22 per cent report doing at least one quarter of their work time in the form of shifts
  - 19 per cent report working at night
  - 47 per cent say they work Saturdays and 24 per cent say they work Sundays.
- Physical environment
  - 29 per cent report being exposed high noise levels
  - 24 per cent report experiencing vibrations

- 21 per cent say they are exposed to low temperatures with 22 per cent reporting exposure to high temperatures
- 23 per cent report that they breathe in vapours and 15 per cent that they handle dangerous substances during at least quarter of their working hours.
- Decision authority
  - 29 per cent feel they are not able to choose or change the rate at which they work, and the same proportion report having no control of their methods of work
  - 35 per cent say they are not able to choose or change the order of their tasks
  - 39 per cent say they are not able to take a break when they want
  - 42 per cent say they are not free to decide when to take holidays or days off.

## The USA

Three further articles reported on population samples in the USA.

Fenwick and Tausig (2001) conducted secondary analyses of full-time workers from Changing Work Force Survey 1992, a randomly selected national sample of employed men and women aged 18 to 64 in the USA. Again, the findings are based on self-report data, so are perceptions of work experience. They found that 60 per cent reported working regular Monday to Friday daytime hours, whereas 31 per cent report that they work non-Monday to Friday schedules, eight per cent say they work non-daytime schedules, and six per cent report working rotating schedules (the latter three categories can overlap).

Ettner and Grzywacz's (2001) survey of 25-74 year old US residents' work found that between 14 per cent and 21 per cent of 25-74 year old US residents report that they work nights at least once a week. They also found that between 31 per cent and 43 per cent of 25-74 year old US residents say that they work more than 45 hours per week.

### 3.3.2 Evidence from selected populations

Further evidence can be found in the retrieved articles that relate to very specific populations. For example, a survey of nurses and psychiatrists employed in the mental health care settings of eight health districts of Stockholm found that 85 per cent of psychiatric nurses and psychiatrists reported that they have been exposed to violent acts over their whole career. Of those who were exposed to violence over their career, 14 per cent experienced this once, 62 per cent reported it as occurring several times and nine per cent reported it as very often. 57 per cent said they had been exposed

to violence in the past 12 months. 97 per cent had been assaulted by patients, 12.5 per cent by patients' relatives and five per cent by fellow staff members. Those that had experienced violence at some time reported the following types of incidents: being threatened by their perpetrators (89 per cent), being spat at (25 per cent), being scratched or pinched (20 per cent), being physically abused (48 per cent), being threatened with an object (61 per cent) and attacked with some object (nine per cent) (Soares, 2000).

Cortina *et al.* (2001), in their survey of the US Eighth Circuit federal court system (all employees excluding judges), found that 71 per cent of employees of the USA's eighth federal court reported that they had experienced workplace incivility in the previous five years. Forty-eight per cent experienced incivility in conjunction with sexual harassment, 23 per cent experienced incivility in isolation. Thirty-nine per cent said they had encountered uncivil behaviour once or twice, 25 per cent experienced it sometimes, and six per cent experienced it often or many times.

While the figures above give some indication of the scale of the problem, it is not possible to generalise to the entire working population, because they only relate to specific occupational groups. For the purposes of this review, such evidence is thus of limited use. However, further consideration of specific occupational groups may be required at a later stage in the development of management standards.

In addition to the evidence cited here, there are a number of other large-scale studies of specific populations, *eg* the Modern Manufacturing Practices Survey (Institute of Work Psychology, University of Sheffield) and the NHS Workforce Initiative (Institute of Work Psychology, University of Sheffield) both have data available in published papers which could be of use in this context.

## **3.4 Sources of information for further exploration**

Two additional sources of information on the incidence of work related stressors have been identified.

### **3.4.1 Secondary analysis of national surveys**

First, there are a number of nationally representative surveys which may contain questions of relevance. **The Labour Force Survey**, a large nationally representative survey conducted four times a year contains questions on:

- number of hours worked per week, including and excluding overtime

- whether shift work is done and the pattern involved; night work, evening work, unsocial hours.

In addition, questions about work related stress are occasionally asked in the LFS. For example, in the Summer quarter of 1999, respondents were asked:

- whether during the past 12 months they had suffered any illness, disability or physical or mental problem caused or made worse by job or work done in the past
- the type of illness caused or aggravated by work in the last year (including a category of 'stress, depression or anxiety')
- the total time off over last year as a result of illness caused or aggravated by work in the last 12 months.

Another potential source is the **European Survey on Working Conditions**, which has been conducted every five years since 1990. The most recent survey included a total of 21,703 workers (employees and self-employed) across the EU, using random sampling methods. Some findings from Paoli and Merllié's (2001) report on the third European survey on working conditions (2000) are given in the sections above. This published report provides a limited number of questions broken down by country, but it is possible that more comprehensive data from the survey are available for further analysis.

### **3.4.2 Data mining from published papers**

It was also noted that some incidence and prevalence figures could be calculated from reported statistics in some of the papers selected for review. For example, by working backwards from the means and standard deviations presented in the paper. Whilst this level of data mining was outside the scope of the current review, it provides scope for future investigation.

## **3.5 Summary**

This chapter reviewed the best available evidence concerning what proportion of the population are exposed to harmful levels of each of the nine stressors. Although only one UK study could be found to contribute evidence to this review question, this study did provide information that related to eight of the nine stressors.

The evidence is based on self-report data usually collected at a single time point. This means that it tells us about how individuals perceive and experience their workplace, rather than about the actual levels of problems that exist.

In summary, this study of a sample of the general population found that:



- over 80 per cent felt themselves to have experienced high work pace and intensity
- over 80 per cent reported a lack of variety in their work
- over half felt that they lacked decision authority over their work environment and who they work with
- about one-third perceived themselves as being exposed to unpredictable, long, unsociable or inflexible work schedules
- a quarter said they were exposed to physical hazards such as noise and harmful substances
- less than a quarter felt they were exposed to a lack of social support at work
- seven per cent reported that they had experienced bullying.

Similar figures were apparent from other European surveys. However, evidence from specific populations demonstrated that some employees were more at risk than others.

It is also important to note that exposure is different from impact. The fact that a certain percentage of employees perceive, for example, that they have a high work pace (*ie* are exposed to it) does not mean that that percentage will go on to suffer ill-effects (*ie* have an impact from it). The data on impact, or evidence for cause and effect is reviewed in the next chapter.

## **4. Review Question 2: The Impact of Exposure to the Nine Stressors**

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This section describes the findings in relation to the second review question. The research team reviewed the available research to identify the effects of the nine stressors on health, well-being and organisational performance.

### **4.1 Demands: Workload**

#### **What is the evidence for the impact of exposure to the stressors grouped under workload?**

In the HSE framework (Appendix A), the stressor identified as workload is described as: under and over; quantity (volume); pacing and time pressure; interruptions; complexity/intensity; emotional component of the job (*eg* social work); worry about error making in safety-critical jobs; worry about consequences of failure to cope with load; and links to boring/repetitive (underload).

##### **4.1.1 Number of papers and samples**

In total, 24 papers provided some form of evidence about the impact of exposure to different levels of workload. Details of these papers are summarised in Tables 4.1 (work-related outcomes) and 4.2 (health-related outcomes). Of these, 13 studies were based on UK samples, four were based on US samples, two were based on Australasian samples and three on other European samples. One meta-analysis and one systematic review were included. Two of the samples were drawn from the general population, whilst others came from specific organisations and departments, including six samples from manufacturing/engineering, three samples of nurses, three samples of administrative/clerical workers, one sample of teachers and one sample of driving instructors. In addition, five of the papers were based on one sample of civil servants from the same study.

### **4.1.2 Study design**

The majority of studies are based on cohort samples (16), two were within-subjects field experiments, one compared non-equivalent groups, two were diary studies, one was a meta-analysis and one was a systematic review.

The majority of studies were of very similar design, in that they used largely self-report measures of workload taken at two or more time points over the course of the study. Few studies incorporated objective measures of workload. There was much variation in the length of the follow-up period of these studies, ranging from two days in the shortest case to five years in the longest.

### **4.1.3 Measures of workload**

Types of measures of workload included within this category were largely self-report on standardised measures of job demands (eg perceived work demands, perceived role overload). Other measures included self-reported hours of work, perceived levels of demand for monitoring and problem solving, perceived time pressure, and perceived effort.

Very few studies used other measures of work conditions. Those that did were based in the healthcare sector, and measures included supervisor assessments of patient load, patient contact hours and number of deaths witnessed. One study made use of naturally occurring variations in job conditions to provide high and low workload settings.

### **4.1.4 Outcome measures**

A wide variety of different outcome measures were used to assess the impact of workload on individuals. The measures were a combination of objective and subjective data, with the majority relying on self reports. Impact could be broken down into work related and health-related outcomes. The descriptions of measures given here use the labels given to measures in the research. The report therefore refers to measures of 'work stress', although this outcome might be more conventionally labelled 'strain'.

Subjective measures of work-related outcomes included work stress (strain), job satisfaction (including job-related enthusiasm and contentment); job strain; depersonalisation and perceived performance.

Objective measures of work-related outcomes included: appraisal ratings; work injuries; cognitive performance; and short and long spells of sickness absence.

Subjective measures of health outcomes included: perceived ill-health; health complaints; health symptoms; depression; irritation; worrying; tension-anxiety; exhaustion; negative mood; mental health; psychological well-being; psychiatric disorder; social functioning; physical functioning; and emotional exhaustion.

Objective measures of health outcomes included: salivary cortisol; blood pressure; incidence of heart disease; and health care costs.

#### **4.1.5 Findings and consistency of evidence: Impact of workload on work-related outcomes**

Twelve papers provided evidence about the impact of workload on work-related outcomes (including one meta-analysis). (See Table 4.1.)

##### **Meta-analysis**

Findings from the meta-analysis found significant and large associations between high workload and depersonalisation. Work pressure was also found to be significantly associated with depersonalisation (*ie* becoming detached and distant from work). Neither high workload nor work pressure were found to be significantly associated with low personal accomplishment. Overall, the authors suggest that those exposed to monotonous and high-paced work are more likely to report depersonalisation. The authors note that the meta-analysis does not confirm the causal sequence of symptom development, only demonstrating associations.

##### **Individual papers**

Of the eleven remaining papers, five found clear causal relationships between workload and outcome measures (although not always in the predicted direction), one had mixed findings, and five reported non-significant findings.

In a general survey of the UK population (364), self-reports of workload were found to be related to reports of work stress twelve months later. A study in a UK manufacturing plant (82) found that self-reported work overload was a strong predictor of self-reported job strain over an 18 month time period. A study of driving examiners (335) found that their cognitive performance was significantly affected by the amount of work scheduled for the day (number of driving tests).

Somewhat contradictory findings are reported in two papers based on a large sample of UK Civil servants (403 and 406). These found that those with a low work pace had increased spells of both short and long duration absence when compared to those with high work pace. In one of the studies, this effect was

particularly pronounced in men (1.4 times more likely to take short absence and nearly 1.3 times more likely to take long absence), but not as large in women (1.2 times as likely to take short absence and but only slightly more likely to take long absence).

The second study looked at the role of low work pace in relation to absence due to back pain. This was found to be non-significant in the case of long spells of absence, but both men and women were more likely to take short absences due to low back pain if they had a low work pace, compared to those with high work pace (1.8 times more likely for men and 1.4 times more likely for women).

One study found a significant negative impact of patient contact hours on subsequent appraisal ratings of performance, but not on self-reported job satisfaction (306). Perceived workload and actual numbers of patients were not found to be related to subsequent job satisfaction or appraisal ratings.

The remaining five studies reported non-significant relationships between:

- work overload and work injuries (148)
- role overload and safe working (82)
- increase in demands and job satisfaction and job strain (73)
- attentional demands and cost responsibility, and job satisfaction, enthusiasm and contentment (164)
- perceived work overload and job satisfaction, depersonalisation and performance (392).

**Table 4.1: Evidence for the impact of workload on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size	
364	cohort	12m	General popn	UK	—	1.8k	N	workload <sup>1</sup>	work stress <sup>1</sup>	significant <sup>3</sup>	
306	cohort	2m	Full-time nurses	US	—	136	N	workload <sup>1</sup> patient contact hrs <sup>2</sup> no. of patients <sup>2</sup>	job satisfaction <sup>1</sup> appraisal ratings <sup>2</sup> job satisfaction <sup>1</sup> appraisal ratings <sup>2</sup> job satisfaction <sup>1</sup> appraisal ratings <sup>2</sup>	not significant not significant r = -.22 not significant not significant	
148	cohort	12m	Manufac. employees	Australasia	—	362	N	work overload <sup>1</sup>	work injuries <sup>2</sup>	not significant	
82	cohort	18m	Manufac. employees	UK	—	161	Y	role overload <sup>1</sup>	safe working <sup>1</sup>	not significant	
73	cohort	4yrs	Chemical processing company	UK	—	139	Y	increase in demands <sup>1</sup>	job satisfaction <sup>1</sup> job strain <sup>1</sup>	not significant not significant	
164	within-subjects field expt	4wks	Dept. of electronics company	UK	within-subjects	14	N/A	attentional demands <sup>1</sup> cost responsibility <sup>1</sup>	job satisfaction <sup>1</sup> enthusiasm <sup>1</sup> contentment <sup>1</sup> job satisfaction <sup>1</sup> enthusiasm <sup>1</sup> contentment <sup>1</sup>	not significant not significant not significant not significant not significant not significant	
39	178	non-equivalent grps	18m	Vehicle manuf. employees	UK	perm. contracts at T1 and T2	332	Y	role overload <sup>1</sup>	job strain <sup>1</sup>	r = .17
392	cohort	6wks	University clerical workers	Australasia	—	80	N	work overload <sup>1</sup>	job satisfaction <sup>1</sup> depersonalisation <sup>1</sup> performance <sup>1</sup>	not significant not significant not significant	
403	cohort	4yrs	Civil servants	UK	—	10k+	Y	low work pace <sup>1</sup>	short spells of sickness absence <sup>2</sup> long spells of sickness absence <sup>2</sup>	OR=1.43 in men, OR=1.22 in women OR=1.27 in men, OR=1.12 in women	
335	within-subjects	3m	Driving examiners	UK	—	49	N/A	number of driving tests per day <sup>2</sup>	cognitive performance <sup>2</sup>	significant <sup>3</sup>	
406	cohort	4yrs	Civil servants	UK	—	10k+	Y	low work pace <sup>1</sup>	short absence due to back pain <sup>2</sup> long absence due to back pain <sup>2</sup>	OR=1.79 in men, OR=1.42 in women not significant	
233	meta-analysis	—	5 studies 7 studies 5 studies 5 studies	—	—	1,033 1,616 681 681	—	workload work pressure	depersonalisation personal accompt depersonalisation personal accompt	r = .34 not significant r = .22 not significant	

References:

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- 233 Lee R T, Ashforth B E (1996), 'A Meta-Analytic Examination of the Correlates of the Three Dimensions of Job Burnout', *Journal of Applied Psychology*, Vol. 81, No. 2, pp. 123-133

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

#### **4.1.6 Findings and consistency of evidence: impact of workload on health outcomes**

Fourteen papers provided evidence about the impact of workload on health-related outcomes including one meta-analysis and one systematic review (see Table 4.2).

##### **Systematic review and meta-analysis**

Findings from the systematic review found that monotonous and high paced work affected six per cent of men and 16 per cent of women. The authors conclude that six per cent of cardiovascular heart disease in men and 14 per cent in women would not have occurred if this work factor was not present.

Findings from the meta-analysis found significant and large associations between high workload and emotional exhaustion. Work pressure was also found to be significantly associated with emotional exhaustion.

##### **Individual papers**

Of the remaining 12 papers, nine found some evidence for the impact of workload on health outcomes, and three found no evidence of a relationship.

Time pressure among a German sample from the general population (270) was found to lead to increased health complaints and worrying 24 months subsequently, although depression and irritation were not found to be causally linked to time pressure.

Perceived work demands in a sample of US office workers (59) were found to be linked to subsequent health symptoms, but not to reports of daily life stress, depression or tension-anxiety twelve months on.

A diary study of workers in a UK accounts department (102) found significant links between time pressure and workload, and exhaustion, over a four week period. Time pressure was also significantly linked to negative mood.

A diary study of school teachers in the Netherlands (380) found that time pressure was a significant determinant of general well-being, over a two week period.

A large study of UK civil servants (404) found that over 40 per cent of both men and women who reported experiencing high work pace also subsequently suffered from psychiatric disorder. From the same study, another paper (407) reports that when high job demands were measured, they were found to account for a substantial increase in psychiatric disorder in both men (1.33 times more likely than those without high job demands) and women



(1.24 times more likely). A third paper from the study (408) reports that high job demands had a large and significant impact on the social functioning, physical functioning and mental health of female respondents, but the pattern was not significant for men.

A study of US nurses (305) found that self-reported workload and patient contact hours were significantly related to subsequent health care costs, but not to self-reported mental health. Patient load (*ie* numbers of patients) did not relate to either outcome.

Nine of the papers also reported some non-significant relationships between workload and outcome variables. In addition to those mentioned above, these non-significant results were:

- additional demands and cost responsibility, and anxiety, depression and mental health measures
- perceived workload and self-reported mental health
- patient contact hours and numbers of patients with psychological distress and salivary cortisol.

**Table 4.2: Evidence for the impact of workload on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
306	cohort	2m	Full-time nurses	US	—	136	N	workload <sup>1</sup>	ill health <sup>1</sup> salivary cortisol <sup>2</sup> blood pressure <sup>2</sup>	not significant not significant not significant
								patient contact hrs <sup>2</sup>	ill health <sup>1</sup> salivary cortisol <sup>2</sup> blood pressure <sup>2</sup>	not significant r=.18 at home r=.28 systolic, r=.20 diastolic at work
								no. of patients <sup>2</sup>	ill health <sup>1</sup> salivary cortisol <sup>2</sup> blood pressure <sup>2</sup>	not significant not significant r=.19 systolic at work, r=.20 diastolic at work, r=.17 diastolic at home
270	cohort	24m	General popn.	German	—	400+	Y	time pressure <sup>1</sup>	depression <sup>1</sup> health complaints <sup>1</sup> irritation <sup>1</sup> worrying <sup>1</sup>	not significant significant <sup>3</sup> not significant significant <sup>3</sup>
59	cohort	12m	Office workers	US	—	136	Y	workload <sup>1</sup>	tension-anxiety <sup>1</sup> depression <sup>1</sup> daily life stress <sup>1</sup> health symptoms <sup>1</sup>	not tested not tested not significant r=.14
102	within-subjects, diary study	4wks	Accounts dept.	UK	within-subjects	7	N/A	time pressure <sup>1</sup>	exhaustion <sup>1</sup> negative mood <sup>1</sup>	sig linear+non-linear <sup>3</sup> significant <sup>3</sup>
								sustained workload <sup>1</sup>	exhaustion <sup>1</sup> negative mood <sup>1</sup>	not significant not significant
164	within-subjects field expt	4wks	Dept. of electronics company	UK	within-subjects	14	N	attentional demands <sup>1</sup>	anxiety <sup>1</sup> depression <sup>1</sup> mental health <sup>1</sup>	not significant not significant not significant
								cost responsibility <sup>1</sup>	anxiety <sup>1</sup> depression <sup>1</sup> mental health <sup>1</sup>	not significant not significant not significant
380	diary study	2wks	School teachers	Netherlands	—	100	N/A	time pressure <sup>1</sup>	well-being <sup>1</sup>	significant <sup>3</sup>
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	high work pace <sup>1</sup>	well-being <sup>1</sup> psychiatric disorder <sup>1</sup>	not significant OR=1.42 in men, OR=1.45 in women
								high work pace <sup>2</sup>	well-being <sup>1</sup> psychiatric disorder <sup>1</sup>	not significant not significant
244	cohort	6m	Assembly line of car manuf.	UK	—	35	Y	workload <sup>1</sup>	mental health <sup>1</sup>	not significant

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
407	cohort	4yrs	Civil servants	UK	—	10k+	Y	high job demands <sup>1</sup>	social functioning <sup>1</sup> physical functioning <sup>1</sup> mental health <sup>1</sup>	OR = 1.91 in women, not sig. in men OR=2.03 in women, not sig in men OR=1.57 in women, not sig. in men
408	cohort	4yrs	Civil servants	UK	—	10k+	Y	high job demands <sup>1</sup>	psychiatric disorder <sup>1</sup>	OR=1.33 for men OR=1.24 for women
281	cohort	2 days	Nurses	US	—	136	N	patient contact hrs <sup>2</sup> no. of patients <sup>2</sup> workload <sup>1</sup>	psycl distress <sup>1</sup> salivary cortisol <sup>2</sup> psycl distress <sup>1</sup> salivary cortisol <sup>2</sup> psychl distress <sup>1</sup> salivary cortisol <sup>2</sup>	not significant not significant not significant not significant not significant
305	cohort	5yrs	Full-time nurses	US	—	105	Y	workload <sup>1</sup> patient contact hrs <sup>2</sup> patient load <sup>2</sup>	mental health <sup>1</sup> health care costs <sup>2</sup> mental health <sup>1</sup> health care costs <sup>2</sup> mental health <sup>1</sup> health care costs <sup>2</sup>	not significant significant <sup>3</sup> not significant significant <sup>3</sup> not significant not significant
233	meta-analysis	—	6 studies 5 studies	—	—	1,450 681	—	workload work pressure	emotl exhaustion emotl exhaustion	r = .65 r = .50
332	systematic review	—	—	Denmark	—	—	—	monotonous and high paced work	heart disease	RR = 2.0

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- 270 Garst H, Frese M, Molenaar P C M (2000), 'The Temporal Factor of Change in Stressor-Strain Relationships: A Growth Curve Model on a Longitudinal Study in East Germany', *Journal of Applied Psychology*, Vol. 85, No. 3, pp. 417-438
- 59 Carayon P (1993), 'A Longitudinal Test of Karasek's Job Strain Model Among Office Workers', *Work & Stress*, Vol. 7, No. 4, pp. 299-314
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- 380 Sonnentag S (2001), 'Work, Recovery Activities, and Individual Well-Being: A Diary Study', *Journal of Occupational Health Psychology*, Vol. 6, No. 3, pp. 196-210
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- 244 Parker S K, Wall T D, Myers C (1995), 'The Effects of a Manufacturing Initiative on Employee Jobs and Strain', *Contemporary Ergonomics*, Vol. 15, No. 15, pp. 37-42
- 407 Stansfeld S A, Bosma H, Hemingway H, Marmot M G (1998), 'Psychosocial Work Characteristics and Social Support as Predictors of SF-36 Health Functioning: The Whitehall II Study', *Psychosomatic Medicine*, Vol. 60, pp. 247-255
- 408 Stansfeld S A, Fuhrer R, Shipley M J, Marmot M G (1999), 'Work Characteristics Predict Psychiatric Disorder: Prospective Results From The Whitehall II Study', *Occupational and Environmental Medicine*, Vol. 56, pp. 302-307
- 281 Fox M L, Dwyer D L (1995), 'Stressful Job Demands and Worker Health: An Investigation of the Effects of Self-Monitoring', *Journal of Applied Social Psychology*, Vol. 25, No. 22, pp.1973-1995
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- 233 Lee R T, Ashforth B E (1996), 'A Meta-Analytic Examination of the Correlates of the Three Dimensions of Job Burnout', *Journal of Applied Psychology*, Vol. 81, No. 2, pp. 123-133
- 332 Olsen O, Kristensen T S (1991), 'Impact of Work Environment on Cardiovascular Diseases in Denmark', *Journal of Epidemiology and Community Health*, Vol. 45, pp. 4-10

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

#### **4.1.7 Effect sizes**

The effect sizes that were reported in the individual papers were generally small to moderate, with correlations varying from .14 to .34 (conventionally referred to as small to medium<sup>1</sup>) and odds ratios and risk ratios ranging from 1.12 to 2.03 (small to moderate). The meta-analysis showed larger corrected correlations of .65 and .50 (large).

#### **4.1.8 Summary**

The pattern of relationships between workload, when studies are considered individually, and work-related or health outcomes, is somewhat mixed. The meta-analysis shows strong relationships between experience of high workload and both depersonalisation and emotional exhaustion. However, the meta-analysis is unable to shed any light on the direction of the causal links between these results.

The systematic review presents strong evidence on the role of workload in cardiovascular heart disease.

Of the individual papers, around half of the studies reviewed found some evidence of increases in workload having a negative impact on outcomes. The evidence for the impact of workload on health outcomes is more consistent than for work-related outcomes. Nearly half of the papers which examined the impact of workload on work-related outcomes, and one quarter of those looking at health outcomes, found no evidence of impact. When workload is considered in isolation, there is no evidence about the impact of workload on a range of job satisfaction type indicators. The most consistent relationship is found between perceived workload and self-reported job strain or work stress. In addition to the negative impact of high workload, low work pace also appears to be related to sickness absence.

One reason workload might sometimes not relate to health outcomes is because there might be a curvilinear relationship between workload and these outcomes. This is discussed more fully in Chapter 5. See Chapter 6 for details of interventions that reduce workload.

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<sup>1</sup> Cohen J (1977), *Statistical Power Analysis for the Behavioural Sciences*. Academic Press, New York

## **4.2 Demands: Work scheduling**

### **What is the evidence for the impact of exposure to the stressors grouped under work scheduling?**

In the HSE framework, the stressor work scheduling is described as: total hours and breaks (includes travelling time and on call time); shift work, night work and unsocial hours (includes isolation); uncertain hours; multiple part-time jobs.

#### **4.2.1 Number of papers and samples**

In total, nine papers were reviewed that provide some form of evidence for the impact of work scheduling practices. Details of these papers are summarised in Tables 4.3 (work-related outcomes) and 4.4 (health-related outcomes). Of these, four were meta-analyses and one was a systematic review. Two studies are based on UK samples, one based on a North American sample, and two based on other European samples. Two of the samples are general populations, one is a mixed working population from a number of different organisations, and one is a sample of offshore oil platform control room operators.

#### **Study design**

Three of the individual papers are cohort studies, the follow-up period ranging from 12 months to 11 years, and the fourth is a within-subjects design.

#### **Measures of work scheduling**

Subjective measures of work scheduling cover self-reported working hours and self-reported work scheduling.

Objective measures of work scheduling include: actual working hours; flexitime; compressed working week; various shift systems and shift rotation patterns.

#### **Outcome measures**

A wide range of outcome measures were identified. In the work-related context, self-reported measures were: work stress; productivity; absenteeism; job satisfaction; schedule satisfaction; performance; positive outcomes. No objective work-related outcome measures were identified.

Health-related outcomes included self-reports of heart disease, depression, alertness and sleep length, and an objective measure of cognitive performance.

## **4.2.2 Findings and consistency of evidence: impact of work scheduling on work-related outcomes**

One meta-analysis (271) and one empirical paper (364) considered the impact of work scheduling on work-related outcomes (see Table 4.3). Taken together, the findings consistently demonstrated the impact of different types of work scheduling on work-related outcomes.

### **Meta-analyses**

The meta-analysis considered the impact of flexitime and compressed working weeks on a range of outcomes. Flexitime was found to be positively associated with: general positive outcomes; productivity; absenteeism; job satisfaction; and schedule satisfaction. It was not found to be related to a second measure of performance.

The compressed working week was found to be positively associated with positive outcomes; self-rated performance; job satisfaction and schedule satisfaction. It was found to have no association with productivity or absenteeism.

Taken overall, this evidence represents strong positive and consistent effects of flexitime and compressed working weeks on work-related outcomes. Contrary to expectations, less flexible schedules resulted in slightly larger effect sizes for all positive outcomes, than did more flexible schedules. Effects were found to remain constant when followed up in the longer term. In terms of methodological rigour, the more rigorous studies included in the meta-analysis showed larger effect sizes across all positive outcomes for flexitime studies, but no difference was found for compressed workweek studies.

Analysis also revealed that for studies of flexitime, behavioural outcomes were more greatly affected than attitudinal ones. However, for compressed work week studies, attitudinal outcomes were more greatly affected than behavioural ones.

### **Individual papers**

One individual paper (364) reported a significant relationship between self-reported work schedule and self-reported work stress 12 months subsequently.

A study of offshore workers (501) found highly significant effects of different day/night rotation patterns on subjective alertness and cognitive performance over the 14 day offshore period.

**Table 4.3: Evidence for the impact of work scheduling on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
364	cohort	12m	General popn	UK	—	1.8k	N	work schedule <sup>1</sup>	work stress <sup>1</sup>	significant <sup>3</sup>
271	meta-analysis	—	41 samples	—	—	4,492	—	flexitime	positive outcomes	0.3
			4			316			productivity	0.45
			8			1,034			absenteeism	0.93
			16			2,025			job satisfaction	0.15
			8			554			schedule satisfn	0.32
			5			563			performance	not significant
			25			2,921		compressed work week	positive outcomes	0.29
			4			312			performance	0.42
			8			855			job satisfaction	0.59
			4			477			schedule satisfn	0.40
			4			770			productivity	not significant
			5			507			absenteeism	not significant
501	cohort	14 days	offshore workers	UK		66		shift patterns	mood	significant <sup>3</sup>
									performance	significant <sup>3</sup>

References:

- 49 364 Smith A, Johal S, Wadsworth E, Davey Smith G, Peters T (2000), *The Scale of Occupational Stress: The Bristol Stress and Health at Work Study*, Health & Safety Executive, Contract Research Report 265, HSE Books
- 271 Baltes B B, Briggs T E, Huff J W, Wright J A, Neuman G A (1999), 'Flexible and Compressed Workweek Schedules: A Meta-Analysis of their Effects on Work-Related Criteria', *Journal of Applied Psychology*, Vol. 84, No. 4, pp. 496-513
- 501 Parkes K R, Clark M J, Payne-Cook E (1997), *Psychosocial aspects of work and health in the North Sea Oil and Gas Industry. Part III Sleep, Mood and Performance in Relation to Offshore Shift Rotation Schedules*, Sudbury: HSE Books

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported



### **4.2.3 Findings and consistency of evidence: impact of work scheduling on health outcomes**

Six papers provide evidence about the impact of work scheduling on health-related outcomes, including three meta-analyses and one systematic review (see Table 4.4). As with work-related outcomes, the evidence consistently points to a strong relationship between work scheduling and adverse health outcomes.

#### **Systematic review and meta-analysis**

The systematic review (332) studied evidence on the prevalence of cardiovascular disease (CVD) in shift workers. It examined the prevalence of exposure to various working conditions, relative risk of cardiovascular disease through exposure, and aetiological fraction (*ie* the proportion of cardiovascular disease that would not have occurred had the risk factor not occurred in the population). Results showed that 20 per cent of men and 20 per cent of women are 'exposed' to shift work. Shift workers were four times more likely to develop CVD than non-shift workers. For the whole population, the authors concluded, seven per cent of CVD in men and seven per cent of CVD in women would not have occurred had they not been exposed to this work factor.

One meta-analysis (351) contrasts sleep length of day-shift workers with those on a range of different shift patterns. Results indicate that sleep length in permanent evening shift workers was significantly greater than sleep length reported by the control group of permanent day-shift workers. In contrast, both permanent night and rotating shifts workers had less sleep than the control group.

A similar pattern emerges with different types of rotation, more sleep reported for those with evening shifts occurring in the rotation, but less sleep for those with morning or night shifts. Rapidly rotating shifts also resulted in less sleep than slower rotating shifts. Furthermore, within both rapid and slow rotation the same basic pattern of effects for type of shift emerged – night shifts having the most detrimental effect on sleep, followed by day shifts, and evenings having a positive effect on sleep patterns.

The second meta-analysis (354) found a small but significant correlation between working hours and physiological health (.08) and a significant correlation of .15 with psychological health.

The third meta-analysis (500) found a small but significant correlation of .08 between working hours and health outcomes.

#### **Individual papers**

Again, consistent results were found in relation to depression, heart disease, sleep, alertness and cognitive performance. A study

of 3,830 Canadian women (342) conducted over a two year period found that those who reported working more than 41 hours per week (compared to women who worked between 35-40 hours) were more than twice as likely to experience a major depressive episode. A study of shift work in offshore oil platform (465) control room operators found that the shift change phase, which covered a 24 hour period during which operators worked with only a few hours break, was characterised by sleep loss, low alertness and slow cognitive performance. Shift work in a mixed working population from Finland (343) was found to increase the risk of heart disease by 1.5 times compared to those not working shifts.

**Table 4.4: Evidence for the impact of work scheduling on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
343	cohort	11yrs	Mixed	Finland	—	1,947	N	shift work <sup>1</sup>	heart disease <sup>2</sup>	RR = 1.50
342	cohort	2yrs	General popn	Canada	—	3,830	Y	working hours <sup>1</sup>	depression <sup>1</sup>	OR = 2.2 in women, not significant in men
465	within-subjects	2wks	offshore oil rig control room operators	UK	—	18	N	shift change <sup>2</sup>	alertness <sup>1</sup> sleep <sup>1</sup> cognitive perf. <sup>2</sup>	significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup>
501	cohort	14 days	offshore workers	UK	—	66	—	different shifts	sleep	significant <sup>3</sup>
354	meta-analysis	—	21 samples 12 17	—	—	37,623 17,541 35,445	—	working hours	physiological health psychological health	r = .06  r = .15
351	meta-analysis	—	8 samples 20 137 36 39 49 106 31	—	day-shift workers	1,198 1,604 8,316 2,578 2,325 2,620 106 31	—	evening shift night shift rotating shift rotating – morning rotating – evening rotating – night rapid rotation slow rotation	sleep length	0.42 -0.35 -0.33 -0.34 0.85 -0.96 -0.38 -0.32
332	systematic review	—	—	Denmark	—	—	—	shift work	heart disease	RR = 1.4
500	meta-analysis	—	—	—	—	—	—	working hours	health outcomes	r = .08

References:

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- 342 Shields M (1999), 'Long Working Hours and Health', *Health Reports*, Vol. 11, No. 2, pp. 33-47, Statistics Canada
- 465 Parkes K R (1993), *Human Factors, Shift Work and Alertness in the Offshore Oil Industry*, Health & Safety Executive, Offshore Technology Report 92 389, London: HMSO
- 501 Parkes K R, Clark M J, Payne-Cook E (1997), *Psychosocial aspects of work and health in the North Sea Oil and Gas Industry. Part III Sleep, Mood and Performance in Relation to Offshore Shift Rotation Schedules*, Sudbury: HSE Books
- 354 Sparks K, Cooper C L, Fried Y, Shirom A (1997), 'The Effects of Hours of Work on Health: A Meta-Analytic Review', *Journal of Occupational and Organizational Psychology*, Vol. 70, pp. 391-408

- 351 Pilcher J J, Lambert B J, Huffcutt A I (2000), 'Differential Effects of Permanent Night and Rotating Shifts on Self-Report Sleep Length: A Meta-Analytic Review', *Sleep*, Vol. 23, No. 2, pp. 155-163
- 332 Olsen O, Kristensen T S (1991), 'Impact of Work Environment on Cardiovascular Diseases in Denmark', *Journal of Epidemiology and Community Health*, Vol. 45, pp. 4-10
- 500 Cass M, Faragher B, Cooper C L (2002), *Health and Employment: a review and meta-analysis*, Health and Safety Executive

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

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Source: IES 2002

#### **4.2.4 Effect sizes**

The effect sizes that were reported in the individual papers were generally small, with odds ratios and risk ratios ranging from 1.5 to 2.2 (small). Two meta-analyses produced small effect sizes, with mean correlation coefficients of between .06 and .15, and the other meta-analyses showed larger effect sizes, ranging from .32 to .96.

#### **4.2.5 Summary**

The evidence for work scheduling is clear and consistent. Initiatives such as compressed working weeks and flexitime have a large positive impact on work related outcomes without affecting productivity. Shift work, and certain shift patterns, have consistently negative, yet small, impacts in terms of exposure to conditions linked to heart disease.

### **4.3 Demands: Work organisation**

#### **What is the evidence for the impact of exposure to the stressors grouped under work organisation?**

In the HSE framework, the stressor work organisation is conceptualised as: consideration of employee well-being in designing organisational structure (especially team working); consideration of human capability in job design; task design (eg allocation of function).

##### **4.3.1 Number of papers and sample**

In total, four of the reviewed papers provide some form of evidence for the impact of work organisation; details of these papers are summarised in Tables 4.5 (work-related outcomes) and 4.6 (health-related outcomes). Of these, one is based on a UK sample, two are based on US samples and one is based on an Australian sample. Two of the samples were from manufacturing industries and two were from financial services.

##### **4.3.2 Study design**

Three of the studies were cohort studies in design, ranging from 12 month to four year follow-up periods. The other paper was a between-subjects quasi-experimental design conducted over a two year period.

##### **4.3.3 Measures of work organisation**

Subjective measures included within this category were perceived levels of routinization, motivating potential, and task design (knowledge and task enlargement).

One study used objectively defined teamwork settings (conventional or autonomous work groups).

#### **4.3.4 Outcome measures**

Subjective measures of work-related outcomes included: extrinsic and intrinsic job satisfaction; intrinsic job motivation; organisational commitment; perceived mental overload; perceived error making; perceived efficiency; and perceived performance.

Objective measures of work-related outcomes included work injuries and absenteeism.

Subjective measures of health outcomes included mental health.

No objective measures of health outcomes were included.

#### **4.3.5 Findings and consistency of evidence: impact of work organisation on work-related outcomes**

Four studies considered the impact of work organisation on work-related outcomes (see Table 4.5).

#### **Meta-analyses**

No meta-analyses were identified to contribute evidence.

#### **Individual papers**

All four papers reviewed for this section included evidence of significant relationships between work organisation and work-related outcomes. Details of the papers are displayed in Table 4.5.

Increased routinisation (148) (the degree to which employees' jobs are repetitive) in a manufacturing setting was found to be the most important predictor of lower levels of work injuries amongst employees over a twelve month period.

In a study of employees producing confectionery (150), autonomous group working was found to lead to increases in intrinsic and extrinsic job satisfaction and organisational commitment over a two year period, although it was not found to be related to job motivation. The relationship between increases in autonomy and intrinsic job satisfaction were found to persist over a two year period, but to be less enduring for extrinsic job satisfaction.

Job enlargement amongst bank clerks (192) was found to increase organisational commitment, job satisfaction and performance over a four year period. However, it had no impact on intention to quit

or absenteeism. Increases in motivating potential (which the job enlargement was designed to improve) were accompanied by increases in both satisfaction and commitment, although these later dropped to their original levels. Job performance improved subsequently and remained at the higher level at the four year follow up.

A study of financial service employees (157) found that task enlargement significantly increased reported mental overload, error-making and reduced efficiency. Knowledge enlargement on the other hand was found to reduce error-making without affecting mental overload or efficiency.

**Table 4.5: Evidence for the impact of work organisation on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
148	cohort	12m	Manuf. employees	Australasia	—	362	N	routinization <sup>1</sup>	work injuries <sup>2</sup>	r = .42
150	between-subjects, 4 groups (autonomous or conventional)	2yrs	Confectionery manuf.	UK	2 groups working conventionally	126	N	autonomous work groups <sup>2</sup>	intrinsic job satis <sup>1</sup> extrinsic job satis <sup>1</sup> org commitment <sup>1</sup> intrinsic job motivation <sup>1</sup>	r2=.02 r2=.01 r2=.01 not significant
192	cohort	4yrs	Clerks from 38 bank branches	US	—	526	N	motivating potential <sup>1</sup>	org.l commitment <sup>1</sup> job satisfaction performance <sup>1</sup> intention to quit <sup>1</sup> absenteeism <sup>2</sup>	r = .13 r = .16 r = .20 not significant not significant
157	cohort	2yrs	Financial services employees	US	—	129	Y	task enlargement <sup>1</sup>  knowledge enlargement <sup>1</sup>	mental load <sup>1</sup> error making <sup>1</sup> lower efficiency <sup>1</sup> mental load <sup>1</sup> error-catching <sup>1</sup> lower efficiency <sup>1</sup>	significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> not significant significant <sup>3</sup> not significant

References:

- 148 Iverson R D, Erwin P J (1997), 'Predicting Occupational Injury: The Role of Affectivity', *Journal of Occupational and Organizational Psychology*, Vol. 70, pp. 113-128
- 150 Wall T D, Kemp N J, Jackson P R, Clegg C W (1986), 'Outcomes of Autonomous Workgroups: A Long-Term Field Experiment', *Academy of Management Journal*, Vol. 29, No. 2, pp. 280-304
- 192 Griffin R W (1991), 'Effects of Work Redesign on Employee Perceptions, Attitudes, and Behaviors: A Long-Term Investigation', *Academy of Management Journal*, Vol. 34, No. 2, pp. 425-435
- 157 Champion M A, McClelland C L (1993), 'Follow-Up and Extension of the Interdisciplinary Costs and Benefits of Enlarged Jobs', *Journal of Applied Psychology*, Vol. 78, No. 3, pp. 339-351

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported



#### **4.3.6 Findings and consistency of evidence: Impact of work organisation on health outcomes**

One study considered the impact of work organisation on health outcomes (see Table 4.6).

##### **Meta-analyses**

No meta-analyses were identified to contribute evidence.

##### **Individual papers**

One study examined the impact of autonomous group working on mental health and found no significant causal relationship.

**Table 4.6: Evidence for the impact of work organisation on health-related outcomes**

<b>Paper</b>	<b>Design</b>	<b>Timescale</b>	<b>Sample</b>	<b>Country</b>	<b>Control</b>	<b>N</b>	<b>Baseline</b>	<b>Stressors</b>	<b>Outcomes</b>	<b>Effect size</b>
150	between-subjects, 4 groups (autonomous or conventional)	2yrs	Confectionery manuf.	UK	2 groups doing conventional work	126	N	autonomous work groups <sup>2</sup>	mental health <sup>1</sup>	not significant

References:

150 Wall T D, Kemp N J, Jackson P R, Clegg C W (1986), 'Outcomes of Autonomous Workgroups: A Long-Term Field Experiment', *Academy of Management Journal*, Vol. 29, No. 2, pp. 280-304

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

Source: IES 2002

### **4.3.7 Effect sizes**

The effect sizes that were reported were generally small, correlation coefficients ranging from .13 to .20, and R2 statistics of .01 and .02.

### **4.3.8 Summary**

The evidence on the impact of work organisation is limited, but suggests that there are clear (if small) improvements in a range of work-related outcomes following improvements to the way in which work is organised. Such changes were not found to have a significant relationship with mental health.

## **4.4 Demands: Physical environment**

### **What is the evidence for the impact of exposure to the stressors grouped under physical environment?**

In the HSE framework, the stressor physical environment is conceptualised as the impact of poorly designed/managed physical environment on mental well-being and includes: danger (real and perceived, including violence); exposure to toxic substances; noise; vibration; and thermal environment.

#### **4.4.1 Number of papers and samples**

In total, seven papers were reviewed which provide evidence about the impact of exposure to a range of physical environment factors. Details of these papers are summarised in Tables 4.7 (work-related outcomes) and 4.8 (health-related outcomes). Of these, one is based on a UK sample, one is based on a US sample and four are based on other European samples. One of the papers is a meta-analysis and one is a systematic review. Two of the papers are based on samples taken from the general population, one is based on a sample taken from 21 different industrial plants, and the other two papers are based on samples from an insurance company and technical maintenance workers respectively.

#### **4.4.2 Study design**

Four of the studies are cohort studies, ranging from 12 months to five years follow-up, and one is a between-subjects experiment.

#### **4.4.3 Measures of physical environment**

Measures of the physical environment covered a diverse range of work factors and were far more likely to be objective than in other areas of the review.

Subjective measures included self reports of: exposure to ergonomic hazards; exposure to chemical hazards; exposure to climatic hazards; exposure to physical hazards; physical agents; passive smoking; physical comfort; and physical work stress.

Objective measures included: noise exposure level; outdoor temperature; exposure to chemical hazards; physical agents; increased privacy; and reduced office density.

#### **4.4.4 Outcome measures**

Subjective measures of work-related outcomes included: work stress; job satisfaction; performance; emotional exhaustion; depersonalisation; and personal accomplishment.

Objective measures of work-related outcomes included: absence rate; and absence frequency.

Subjective measures of health outcomes included: self-reported health.

Objective measures of health outcomes included: systolic and diastolic blood pressure; and heart disease.

#### **4.4.5 Findings and consistency of evidence: impact of physical environment on work- related outcomes**

In this area of the review, findings on the impact of the physical environment are largely non-significant.

Four of the papers reviewed provided information about the impact of physical environment factors on work related outcomes. These included one meta-analysis (see Table 4.7).

##### **Meta-analysis**

The meta-analysis (233) brought together findings from four studies with a total N of 433. Results indicated a significant, but slight relationship between physical (dis)comfort and depersonalisation. However, relationships between physical comfort and both emotional exhaustion and personal accomplishment were found to be non-significant.

##### **Individual papers**

A general population survey of 1,800 UK workers (364) found no significant relationship between the presence of physical agents and self-reported work stress.

A study of over 800 employees at 21 industrial plants in Israel (381) found noise exposure level and outdoor temperature to be unrelated to self-reported job satisfaction over a three year period.

An initiative to change the layout of open plan offices (331) involving 91 US employees found that moving to an open plan office with reduced density slightly increased job satisfaction, but did not affect perceived performance. Moving to an office with increased privacy (*ie* with partitions) was found not to be directly related to either satisfaction or performance.

A three year cohort study of 1,755 technical maintenance workers in the Netherlands (191) found that self-reported physical work stress (working conditions) was unrelated to objectively measured absence rates or absence frequency over a three year period.

**Table 4.7: Evidence for the impact of physical environment on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
364	cohort	12m	General popn	UK	—	1.8k	N	physical agents <sup>1</sup>	work stress <sup>1</sup>	not significant
381	cohort	3yrs	21 industrial plants	Israel	—	807	Y	noise exposure level <sup>2</sup> outdoor temperature <sup>2</sup>	job satisfaction <sup>1</sup>	not significant not significant
331	between-subjects, 3 open plan offices	6m	Insurance company employees	US	unchanged open plan office	91	Y	increased privacy <sup>2</sup> reduced density <sup>2</sup>	job satisfaction <sup>1</sup> performance <sup>1</sup> job satisfaction <sup>1</sup> performance <sup>1</sup>	not significant not significant r <sup>2</sup> =.08 not significant
191	cohort	3yrs	Technical maintenance workers	Netherlands	—	1,755	N	physical work stress <sup>1</sup>	absence rate <sup>2</sup> absence freq. <sup>2</sup>	not significant not significant
233	meta-analysis	—	4 samples	—	—	433	—	physical comfort	emotl exhaustion depersonalisation personal accompt	not significant r=.06 not significant

References:

364 Smith A, Johal S, Wadsworth E, Davey Smith G, Peters T (2000), *The Scale of Occupational Stress: The Bristol Stress and Health at Work Study*, Health & Safety Executive, Contract Research Report 265, HSE Books

381 Melamed S, Fried Y, Froom P (2001), 'The Interactive Effect of Chronic Exposure to Noise and Job Complexity on Changes in Blood Pressure and Job Satisfaction: A Longitudinal Study of Industrial Employees', *Journal of Occupational Health Psychology*, Vol. 6, No. 3, pp. 182-195

331 Oldham G R (1988), 'Effects of Changes in the Workspace Partitions and Spatial Density on Employee Reactions: A Quasi-Experiment', *Journal of Applied Psychology*, Vol. 73, No. 2, pp. 253-258

191 Smulders P G W, Nijhuis N F J (1999), 'The Job Demands-Job Control Model and Absence Behaviour: Results of a 3-Year Longitudinal Study', *Work & Stress*, Vol. 13, No. 2, pp. 115-131

233 Lee R T, Ashforth B E (1996), 'A Meta-Analytic Examination of the Correlates of the Three Dimensions of Job Burnout', *Journal of Applied Psychology*, Vol. 81, No. 2, pp. 123-133

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

#### **4.4.6 Findings and consistency of evidence: impact of physical environment on health outcomes**

Three of the papers reviewed provided evidence on the impact of physical environment factors on health outcomes. This included one systematic review (see Table 4.8).

##### **Systematic review**

The systematic review (332), an epidemiological study of Danish data, explored the role of exposure to physical work factors such as noise, chemicals and passive smoking, in contributing to the incidence of heart disease. Significant relationships were found between heart disease and all three physical work factors. Results combine exposure levels and incidence of heart disease to calculate the proportion of the disease which would not have occurred had the particular work factor not been present. They show the following: seven per cent of men and four per cent of women were exposed to noise through their work, and results suggest that one per cent of cardiovascular disease (CVD) in men and one per cent of cardiovascular disease in women would not have occurred if this work factor had not occurred. For chemical exposure, very few men and women were found to be exposed, and it was calculated that one per cent of CVD in men and none in women would have been prevented had this work factor not occurred. For passive smoking, 12 per cent of men and 13 per cent of women were exposed, indicating that two per cent of CVD in men and two per cent of CVD in women would not have occurred if they had not been exposed to this work factor.

##### **Individual papers**

A study of over 800 employees at 21 industrial plants in Israel (381) found noise exposure level and outdoor temperature to be unrelated to changes in blood pressure over a three year period.

A five year population study of the general population in Denmark (320) found that exposure to ergonomic hazards significantly increased the risk of poor self-reported health over a five year period. Chemical, climatic and physical exposure were not found to increase the risk of poor self-reported health.

**Table 4.8: Evidence for the impact of physical environment on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
381	cohort	3yrs	21 industrial plants	Israel	—	807	Y	noise exposure level <sup>2</sup> outdoor temperature <sup>2</sup>	systolic bp <sup>2</sup> diastolic bp <sup>2</sup> systolic bp <sup>2</sup> diastolic bp <sup>2</sup>	not significant not significant not significant not significant
320	cohort	5yrs	General popn	Denmark	—	5,001	Y	ergonomic exposure <sup>1</sup> chemical exposure <sup>1</sup> climatic exposure <sup>1</sup> physical exposure <sup>1</sup>	health <sup>1</sup>	OR = 1.52 not significant not significant not significant
332	systematic review	—	—	Denmark	—	—	—	noise chemical exposure passive smoking	heart disease	RR = 1.2 RR > 1.0 RR = 1.3

References:

- 381 Melamed S, Fried Y, Froom P (2001), 'The Interactive Effect of Chronic Exposure to Noise and Job Complexity on Changes in Blood Pressure and Job Satisfaction: A Longitudinal Study of Industrial Employees', *Journal of Occupational Health Psychology*, Vol. 6, No. 3, pp. 182-195
- 320 Borg V, Kristensen T S, Burr H (2000), 'Work Environment and Changes in Self-Reported Health: A Five Year Follow-Up Study', *Stress Medicine*, Vol. 16, pp. 37-47
- 332 Olsen O, Kristensen T S (1991), 'Impact of Work Environment on Cardiovascular Diseases in Denmark', *Journal of Epidemiology and Community Health*, Vol. 45, pp. 4-10

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

Source: IES 2002



#### **4.4.7 Effect sizes**

Those relationships that were found to be significant showed small effect sizes, with a correlation coefficient of .06, an R<sup>2</sup> statistic of .08, and odds and rate ratios of 1.0 to 1.5.

#### **4.4.8 Summary**

The evidence for the impact of the physical work environment is consistent in finding largely non-significant relationships between these factors and both work-related and health outcome measures. Of the significant relationships that were identified, the most important was self-reported exposure to ergonomic hazards, which increased the risk of an individual having worse self-reported health five years later by 1.5 times. Physical discomfort was also found to be a cause of depersonalisation (although this is a relatively weak relationship). The systematic review points to noise, chemical exposure and passive smoking all contributing slightly to the incidence of heart disease. Otherwise, no significant relationships were found.

### **4.5 Demands: Other forms of demands**

#### **What is the evidence for the impact of exposure to the stressors grouped under other forms of demands?**

This category of stressor was added to the existing HSE framework at the start of the sifting and reviewing process. The purpose was to be as inclusive as possible in our approach to the literature, and to ensure that research on demands which fell outside the HSE framework definition was available for review.

Research fell into this category for one of four reasons:

- the types of demand were too specific to fit the HSE framework (*eg* number of deaths witnessed by nurses, downsizing of personnel), or
- the types of demand measured were too general to be classified under the four HSE demand components of workload, work scheduling, work organisation or physical environment (*eg* job demands), or
- the paper contained some general additional information on demands in addition to the specific areas covered by the framework (*eg* where workload was a subscale of a more general measure of perceived job demands), or
- the nature of the demand studied was conceptually different from the HSE demand components (*eg* job complexity).

### **4.5.1 Number of papers and samples**

The number of papers categorised under 'other demands' amounted to 17. Details of these papers are summarised in Tables 4.9 (work-related outcomes) and 4.10 (health-related outcomes). Of these, 11 appear nowhere else in the demands sections. Four of the samples were from the UK, six were US samples, six were other European, and one was a mixed sample (US and Sweden). Four of the samples were drawn from the general population and two were from a number of different organisations, whilst others came from specific organisations and departments, including three samples from health care, one sample of local government employees, one sample of maintenance workers, one sample of fire and police department employees and one sample of power plant employees. In addition, four of the papers were based on one sample of civil servants from the same study.

### **4.5.2 Study design**

All studies in this section are cohort studies in design. They range in follow-up period from two months to 32 years.

### **4.5.3 Measures of demands**

As would be expected, measures of demand differ considerably across these studies. By far the majority of demands measures are subjective in nature.

These include highly context-specific measures such as the intensity and frequency of patient demands, and psychological job demands. Two studies used scales simply labelled 'conflicting demands'. Six studies included broad measures of job demands. Five studies incorporated some measure of job complexity.

Two studies incorporated objective measures which were: downsizing (reduction in personnel numbers), and numbers of deaths witnessed.

### **4.5.4 Outcome measures**

A range of subjective and objective outcome measures were included the studies.

Subjective measures of work-related outcomes included: job satisfaction; concurrent and retrospective personal initiative; emotional exhaustion; depersonalisation; and personal accomplishment.

Objective measures of work-related outcomes included: appraisal ratings; sickness absence; medically certified absence; short spells of psychiatric sickness absence; absence rate; and absence frequency.

Subjective measures of health outcomes included: self-reported general health, ill-health; well-being; psychiatric disorder; back pain; neck pain; heart disease; psychiatric disorder; alcohol-related problems; symptomatology; and affective disorder.

Objective measures of health outcomes included: blood pressure; salivary cortisol; systolic blood pressure; diastolic blood pressure; heart rate; skin temperature; and catecholamine levels.

#### **4.5.5 Findings and consistency of evidence: impact of other forms of demands on work-related outcomes**

Ten papers provided evidence about the impact of other demands on work-related outcomes (see Table 4.9).

##### **Meta-analyses**

No meta-analyses were found to contribute evidence.

##### **Individual papers**

###### *Specific demands and work-related outcomes*

A study of nurses in the US (306) found that number of deaths witnessed was not significantly related to either job satisfaction or objectively measured appraisal ratings. Similarly, a study of Dutch GPs (376) found that patient demands did not significantly predict emotional exhaustion, depersonalisation or personal accomplishment five years later. However, there was a stable model at both time one and time two of patient demands indirectly associated with emotional exhaustion.

###### *Conflicting demands and work-related outcomes*

Two papers examined the impact of conflicting demands on work-related outcomes. The first, a large study of UK civil servants, revealed that measures of global satisfaction and job satisfaction decreased with increasing conflicting demands.

A second paper based on the same study found that conflicting demands failed to show an effect on objectively measured sickness absence.

###### *Job demands and work-related outcomes*

In a major survey of UK civil servants (406), longitudinal associations were found between high job demands and increased the risk of short spells of psychiatric sickness absence in women but not in men.

Another paper published from the same study (404) found that an individual's perceived job demands were associated with job satisfaction, but the rating of their job demands by a supervisor was not.

A three year study of technical employees in the Netherlands (191) found that the level of job demands was significantly related to absence rate, but not to absence frequency.

#### *Job complexity and work-related outcomes*

Several studies focused on the relationship between job complexity and a range of work-related outcomes. Job complexity generally refers to the amount of cognitive demands a job involves, and can reflect the number of elements in a job, the skill level required, and the overall diversity and sophistication of the job.

In relation to personal initiative, complexity at work predicted an increase in concurrent personal initiative but not in retrospective personal initiative, in a German general population sample (227). Two further studies identified strong relationships between job complexity and job satisfaction. One, a general population survey in the US (267) found that job complexity was positively correlated with job satisfaction. The second, a three-year study covering over 800 employees at 21 industrial plants in Israel, found that job complexity was a strong significant predictor of job satisfaction at follow up (381).

#### *Downsizing and work-related outcomes*

A Finnish study (199) examined the predictors of employee sickness absence following a period of severe economic decline. Downsizing was found to increase significantly the likelihood of sickness absence in both men and women (by 1.37 and 1.75 times respectively).

**Table 4.9: Evidence for the impact of other forms of demands on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
306	cohort	2m	Full-time nurses	US	—	136	N	number of deaths witnessed <sup>2</sup>	job satisfaction <sup>1</sup> appraisal ratings <sup>2</sup>	not significant not significant
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	conflicting demands <sup>2</sup> conflicting demands <sup>1</sup>	job satisfaction <sup>1</sup>	not significant significant <sup>3</sup>
406	cohort	4yrs	Civil servants	UK	—	10k+	Y	conflicting demands <sup>1</sup>	short absence due to back pain <sup>2</sup> long absence due to back pain	not significant not significant
227	cohort	12m	General popn	Germany	—	506	Y	complexity at work <sup>1</sup>	concurrent personal initiative <sup>1</sup> retrospective personal initiative <sup>1</sup>	significant <sup>3</sup> not significant
267	cohort	32yrs	General popn	US	—	151	N	job complexity <sup>1</sup>	job satisfaction <sup>1</sup>	r=.40
376	cohort	5yrs	GPs	Netherlands	—	407	N	patient demands <sup>1</sup>	emotl exhaustion <sup>1</sup> depersonalisation <sup>1</sup> personal accompt <sup>1</sup>	not significant not significant not significant
199	cohort	3yrs	Local government employees	Finland	—	812	Y	downsizing <sup>2</sup>	medically certified absence <sup>2</sup>	RR=1.37 in men, RR=1.75 in women
381	cohort	3yrs	21 industrial plants	Israel	—	807	Y	job complexity <sup>1</sup>	job satisfaction <sup>1</sup>	significant <sup>3</sup>
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	job demands <sup>1</sup>	short spells of psychiatric sickness absence <sup>2</sup>	RR=1.16 in women, not significant in men
191	cohort	3yrs	Employees of technical maintenance firm	Netherlands	—	1,755	N	job demands <sup>1</sup>	absence rate <sup>2</sup> absence freq. <sup>2</sup>	significant <sup>3</sup> not significant

References:

- 306 Fox M L, Dwyer D J, Ganster D C (1993), 'Effects of Stressful Job Demands and Control on Physiological and Attitudinal Outcomes in a Hospital Setting', *Academy of Management Journal*, Vol. 36, No. 2, pp. 289-318
- 404 Stansfeld S A, North F M, White I, Marmot M G (1995), 'Work Characteristics and Psychiatric Disorder in Civil Servants in London', *Journal of Epidemiology and Community Health*, Vol. 49, pp. 48-53
- 406 Hemingway H, Shipley M J, Stansfeld S, Marmot M (1997), 'Sickness Absence from Back Pain, Psychosocial Work Characteristics and Employment Grade Among Office Workers', *Scandinavian Journal of Work and Environmental Health*, Vol. 23, pp. 121-129

- 227 Speier C, Frese M (1997), 'Generalized Self-Efficacy as a Mediator and Moderator Between Control and Complexity at Work and Personal Initiative: A Longitudinal Field Study in East Germany', *Human Performance*, Vol. 10, No. 2, pp. 171-192
- 267 Judge T A, Bono J E, Locke E A (2000), 'Personality and Job Satisfaction: The Mediating Role of Job Characteristics', *Journal of Applied Psychology*, Vol. 85, No. 2, pp. 237-249
- 376 Bakker A B, Schaufeli W B, Sixma H J, Bosveld W, van Dierendock D (2000), 'Patient Demands, Lack of Reciprocity, and Burnout: a Five-Year Longitudinal Study Among General Practitioners', *Journal of Organizational Behavior*, Vol. 21, No. 3, pp. 425-441
- 199 Kivimäki M, Vahtera J, Thomson L, Griffiths A, Cox T, Pentti J (1997), 'Psychosocial Factors Predicting Employee Sickness Absence During Economic Decline', *Journal of Applied Psychology*, Vol. 82, No. 6, pp. 858-872
- 381 Melamed S, Fried Y, Froom P (2001), 'The Interactive Effect of Chronic Exposure to Noise and Job Complexity on Changes in Blood Pressure and Job Satisfaction: A Longitudinal Study of Industrial Employees', *Journal of Occupational Health Psychology*, Vol. 6, No. 3, pp. 182-195
- 236 Stansfeld S A, Fuhrer R, Head J, Ferrie J, Shipley M (1997), 'Work and Psychiatric Disorder in the Whitehall II Study', *Journal of Psychosomatic Research*, Vol. 43, No. 1, pp. 73-81
- 191 Smulders P G W, Nijhuis N F J (1999), 'The Job Demands-Job Control Model and Absence Behaviour: Results of a 3-Year Longitudinal Study', *Work & Stress*, Vol. 13, No. 2, pp. 115-131

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

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Source: IES 2002

#### **4.5.6 Findings and consistency of evidence: impact of other forms of demands on health outcomes**

Eleven papers provided evidence about the impact of other demands on health-related outcomes (see Table 4.10).

##### **Meta-analysis**

No meta-analyses were found to contribute evidence.

##### **Individual papers**

###### *Specific demands and health-related outcomes*

A Danish general population survey (320) conducted over a five-year period found that level of psychological demands was one of six work environmental factors measured at time one which significantly predicted worsened self-reported health five years on, increasing the risk by 1.6 times.

A study of US nursing staff (306) found that specific demands, in the form of the number of deaths witnessed, was not significant in predicting self-reported ill-health, blood pressure or salivary cortisol.

###### *Conflicting demands and health-related outcomes*

A paper reporting on the survey of UK civil servants (404) found somewhat mixed results for the impact of conflicting demands on health-related outcomes, with variation associated with different sources of the measure of conflicting demands. Analysis revealed that reporting of both poor well-being and psychiatric symptoms rose, as did self-reported exposure to conflicting demands. However, the same pattern was not found for externally assessed conflicting demands and poor well-being (ie assessed by employees' personnel managers) for which the relationship with psychiatric disorder was not significant.

###### *Job demands and health-related outcomes*

Hospital employees in the US (97) were studied over a two year period. Self-reported general health, back pain and neck pain all increased significantly over the period of the study. Both increased back pain and increased neck pain were predicted by previous increases in psychological demands.

The large-scale study of UK civil servants, when analysed for the impact of general job demands on health-related outcomes (408) found that high job demands at time one were associated with increased risk of psychiatric disorder for both men and women at the five year follow up. High job demands at time one were also

associated with an increased risk of short spells of psychiatric sickness absence in women but not in men. A second paper based on this sample showed that high job demands also increased the risk of psychiatric disorder.

A study of non-managerial staff in four US power plants (247) established that job demands contributed to the prediction of affective disorder, although their effects on health symptoms was marginal, and on alcohol-related problems was non-significant.

A study of the general populations in Sweden and the US (310) found that job demands directly predicted increases in exhaustion and depression.

#### *Job complexity and health-related outcomes*

Three studies examined the relationship between job complexity and health-related outcomes. The first (149), a seven year study of police and fire department employees, found that job complexity was not related to subsequent cardiovascular disorder. When job complexity was split into task-person complexity and psychological complexity, neither aspect was found to be related to subsequent heart disease.

An Israeli study of job complexity (381) in 807 employees across 21 industrial plants found that job complexity was unrelated to blood pressure during a three year follow-up period.

A study of a US working sample (340) aimed to examine whether chronic demands at work led to adaptive responsivity to challenging situations outside the work situation. The results showed that mental demands were significantly associated with all four responsivity measures (systolic and diastolic blood pressure, heart rate and catecholamine levels), but people complexity was only significantly associated with the blood pressure measures. The authors concluded that 'the study observed consistent effects of two independent classifications of occupational demands with four indiscriminable indexes of cardiovascular responsivity in the laboratory. Occupational demands were also negatively related to recovery from the elevations induced by the acute challenge situations in the laboratory after their removal. This pattern of poor recovery underscores the interpretation of attenuated responsivity as reflecting a degenerative process. Limited responsivity to acute challenge, poor recovery, and chronic elevations indicate a lack of sympathetic nervous system toughening. Therefore, this study provides a partial etiological description of a previously unstudied process linking work demand and health.'



**Table 4.10: Evidence for the impact of other forms of demands on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
320	cohort	5yrs	General popn	Denmark	—	5,001	Y	psychological job demands <sup>1</sup>	health <sup>1</sup>	OR=1.61
306	cohort	2m	Full-time nurses	US	—	136	N	number of deaths witnessed <sup>2</sup>	ill health <sup>1</sup> blood pressure <sup>2</sup> salivary cortisol <sup>2</sup>	not significant not significant not significant
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	conflicting demands <sup>1</sup> conflicting demands <sup>2</sup>	well-being <sup>1</sup> psychiatric disorder <sup>1</sup> well-being <sup>1</sup> psychiatric disorder <sup>1</sup>	OR=1.59 in men, OR=1.53 in women significant <sup>3</sup> not significant not significant
408	cohort	4yrs	Civil servants	UK	—	10k+	Y	job demands <sup>1</sup>	psychiatric disorder <sup>1</sup>	OR=1.33 in men, OR=1.24 in women
97	cohort	2yrs	Hospital employees	US	—	422	Y	job demands <sup>1</sup>	general health <sup>1</sup> back pain <sup>1</sup> neck pain <sup>1</sup>	not significant r <sup>2</sup> =.01 r <sup>2</sup> =.04
149	cohort	7yrs	Fire and police dept. employees	US	—	177	N	psychol complexity <sup>1</sup> task-person complexity <sup>1</sup>	heart disease <sup>1</sup>	not significant not significant
340	cohort	2yrs	Employees of 5 orgs	US	—	390	N	people complexity <sup>1</sup> mental demands <sup>1</sup>	systolic bp <sup>2</sup> diastolic bp <sup>2</sup> heart rate <sup>2</sup> skin temperature <sup>2</sup> catecholamine <sup>2</sup> systolic bp <sup>2</sup> diastolic bp <sup>2</sup> heart rate <sup>2</sup> skin temperature <sup>2</sup> catecholamine <sup>2</sup>	significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> not significant not significant significant <sup>3</sup>
381	cohort	3yrs	21 industrial plants	Israel	—	807	Y	job complexity <sup>1</sup>	systolic bp <sup>2</sup> diastolic bp <sup>2</sup>	not significant not significant
310	cohort	6yrs	General popn	US and Sweden	—	950+	Y	job demands <sup>1</sup>	exhaustion <sup>1</sup> depression <sup>2</sup>	significant <sup>3</sup> significant <sup>3</sup>
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	job demands <sup>1</sup>	psychiatric disorder <sup>1</sup>	RR=1.38 in men, RR=1.52 in women
247	cohort	12m	non-managerial staff in 4 power plants	US	—	325	Y	job demands <sup>1</sup>	alcohol-related problems <sup>1</sup> sympatotomy <sup>1</sup> affective disorder <sup>1</sup>	not significant log odds=.05, p<.07 log odds=0.85

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- 381 Melamed S, Fried Y, Froom P (2001), 'The Interactive Effect of Chronic Exposure to Noise and Job Complexity on Changes in Blood Pressure and Job Satisfaction: A Longitudinal Study of Industrial Employees', *Journal of Occupational Health Psychology*, Vol. 6, No. 3, pp. 182-195
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<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

### **4.5.7 Effect sizes**

The effect sizes reported by these studies were relatively small. The correlation coefficients ranged from .10 to .23 (small), the R<sup>2</sup> statistics ranged from .01 to .04 (small) and odds and rate ratios ranged from 1.38 to 1.61 (small).

### **4.5.8 Summary**

This category covering other forms of demands is diverse and presents mixed findings. Broadly speaking, both job demands and conflicting demands have consistent results in terms of reducing job satisfaction. Job demands were found to be a significant cause of absence, whilst conflicting demands did not contribute to absence, but were found to contribute to the reporting of psychiatric symptoms, as did job demands.

Job complexity was consistently found to lead to better job satisfaction and enhanced concurrent personal initiative, but was not found to be related to heart disease or blood pressure in two of the three studies in this area.

Studies looking at specific demands were not found to be of particular significance in predicting outcomes for either the organisation or the health of the individual, in the studies considered here.

## **4.6 Control: Skill discretion**

### **What is the evidence for the impact of exposure to the stressors grouped under skill discretion?**

In the HSE framework, the stressor skill discretion is conceptualised as: task variety; and perceived opportunity to use skills.

#### **4.6.1 Number of papers and samples**

In total of nine papers were reviewed that provided evidence about the impact of skill discretion. Details of these papers are summarised in Tables 4.11 (work-related outcomes) and 4.12 (health-related outcomes). Of these, three papers are meta-analyses, four are based on UK samples and two on US samples. Three of the publications cover the same sample of civil servants, one is based on US office workers, one is based in a manufacturing setting, and one investigates US nurses.

#### **4.6.2 Study design**

Aside from the three meta-analyses, all the other studies are cohort studies. Samples range from 90 in the smallest study to

over 10,000 in the largest. Follow-up periods range from 12 months to five years.

#### **4.6.3 Measures of skill discretion**

These are largely subjective in nature and based on similar self-report questionnaires.

Subjective measures of skill discretion include: low variety and use of skills; job enlargement; high skill discretion; skill utilisation; task variety; skill variety; and job scope.

No objective measures were identified.

#### **4.6.4 Outcome measures used**

Subjective measures of work-related outcomes included: role breadth self-efficacy, emotional exhaustion; depersonalisation; personal accomplishments; job satisfaction, absence duration and absence frequency.

Objective measures of work-related outcomes included: short spells of sickness absence; long spells of sickness absence; and general sickness absence.

Subjective measures of health outcomes included self-reports of: psychiatric disorder; tension, anxiety and depression; daily life stress; physical health; cardiovascular health; and respiratory health.

Objective measures of health outcomes included health insurance claims.

#### **4.6.5 Findings and consistency of evidence: impact of skill discretion on work-related outcomes**

Six papers provided evidence about the impact of skill discretion on work-related outcomes (see Table 4.11).

#### **Meta-analyses**

Three meta-analyses were identified for this part of the review. The first (233) looked at the relationship between skill utilisation and three work-related outcome variables: emotional exhaustion, depersonalisation and personal accomplishment. Higher skill utilisation was found to be significantly associated with both lower emotional exhaustion and less depersonalisation, but not with personal accomplishment.

The second meta-analysis (186) looked at the impact of task variety on two work-related outcomes: absence duration and absence frequency. Both were found to be negatively related to higher levels of task variety although the relationships were relatively small.

The final meta-analysis (285) explored the relationship between job satisfaction and skill variety. It established a strong association between high skill variety and high job satisfaction.

### **Individual papers**

Three further papers provide evidence about the impact of skill discretion on a range of work-related outcomes.

Findings are largely consistent with the results from the meta-analyses. Job enlargement was found to lead to increased role breadth self-efficacy over an 18 month period in a large sample of manufacturing employees (197). Low variety and low use of skills led to increased absence (both long and short duration) at a four year follow-up in a study of over 10,000 civil servants (403). From the same sample, but described in a separate paper (236), high skill discretion was found to be protective (*ie* associated with lower sickness absence).

**Table 4.11: Evidence for the impact of skill discretion on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
403	cohort	4yrs	Civil servants	UK	—	10k+	Y	low variety and use of skills <sup>1</sup>	short spells of sickness absence <sup>2</sup> long spells of sickness absence <sup>2</sup>	OR=1.72 in men, OR=1.41 in women OR=1.82 in men, OR=1.69 in women
197	cohort	18m	Employees of vehicle maufact.	UK	—	778	Y	job enlargement <sup>1</sup>	role breadth self-efficacy <sup>1</sup>	significant <sup>3</sup>
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	high skill discretion <sup>1</sup>	short spells of psychiatric sickness absence <sup>2</sup>	RR=0.48 in men, RR=0.67 in women
233	meta-analysis	—	7 samples 6 samples 6 samples	—	—	1,701 1,663 1,663	—	skill utilisation	emotl exhaustion depersonalisation personal accompt	r=-0.28 r=-0.39 not significant
186	meta-analysis	—	4 samples 3 samples	—	—	1,051 881	—	task variety	absence duration absence freq.	r=-.13 r=-.06
285	meta-analysis	—	—	—	—	—	—	skill variety	job satisfaction	r=.41

References:

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- 197 Parker S K (1998), 'Enhancing Role Breadth Self-Efficacy: The Roles of Job Enrichment and Other Organizational Interventions', *Journal of Applied Psychology*, Vol. 83, No. 6, pp. 835-852
- 236 Stansfeld S A, Fuhrer R, Head J, Ferrie J, Shipley M (1997), 'Work and Psychiatric Disorder in the Whitehall II Study', *Journal of Psychosomatic Research*, Vol. 43, No. 1, pp. 73-81
- 233 Lee R T, Ashforth B E (1996), 'A Meta-Analytic Examination of the Correlates of the Three Dimensions of Job Burnout', *Journal of Applied Psychology*, Vol. 81, No. 2, pp. 123-133
- 186 Farrell D, Stamm C L (1988), 'Meta-Analysis of the Correlates of Employee Absence', *Human Relations*, Vol. 41, pp. 211-227
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<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

#### **4.6.6 Findings and consistency of evidence: impact of skill discretion on health outcomes**

Four papers provided evidence about the impact of skill discretion on health outcomes (see Table 4.12).

##### **Meta-analyses**

No meta-analyses were found to contribute evidence.

##### **Individual papers**

Four papers provide evidence about the impact of skill discretion on health-related outcomes. With the exception of one paper, the results are inconsistent.

A large study of UK Civil servants (404) found that both men and women who reported low variety and use of skills were more likely to report symptoms of psychiatric disorder four years later. However, another paper based on the same sample (236) also found no significant relationship between low skill discretion and psychiatric disorder. This may be due to the fully adjusted model (controlling for age, grade, other work characteristics and baseline psychiatric disorder) that was analysed in the latter study.

One study of 90 US nurses (42) found no relationship between two measures of skill discretion (skill utilisation and job scope) and three health outcome measures (cardiovascular health; respiratory health and health insurance claims) over a five year period.

The fourth study (59) was unable to analyse the results fully because statistical assumptions were not met by the data.

**Table 4.12: Evidence for the impact of skill discretion on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	low variety and use of skills <sup>1</sup>	psychiatric disorder <sup>2</sup>	OR=1.29 in men, OR=1.26 in women
59	cohort	12m	Office workers	US	—	136	N	skill utilisation	tension-anxiety <sup>1</sup> depression <sup>1</sup> daily life stress <sup>1</sup> physical health <sup>1</sup>	not tested not tested not tested not tested
42	cohort	5yrs	Nurses	US	—	90	Y	skill utilisation <sup>1</sup>	cardio. health <sup>1</sup> respiratory health <sup>1</sup> health insurance claims <sup>2</sup> cardio. health <sup>1</sup> respiratory health <sup>1</sup> health insurance claims <sup>2</sup>	not significant not significant not significant not significant not significant not significant
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	low skill discretion <sup>1</sup>	psychiatric disorder <sup>1</sup>	not significant

References:

- 404 Stansfeld S A, North F M, White I, Marmot M G (1995), 'Work Characteristics and Psychiatric Disorder in Civil Servants in London', *Journal of Epidemiology and Community Health*, Vol. 49, pp. 48-53
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<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported



#### **4.6.7 Effect sizes**

The effect sizes that were reported in the individual papers were small to moderate, with correlation coefficients ranging in size from .06 to .41, and odds and rate ratios ranging between from 1.26 to 1.82.

#### **4.6.8 Summary**

The evidence relating to skill discretion paints an interesting if counter-intuitive picture. The evidence as it relates to work-related outcomes is clear cut. Low skill discretion has a negative impact on the full range of work-related outcomes measured in this research. It leads to a greater likelihood of both short and long periods of sickness absence and is associated with emotional exhaustion, depersonalisation, absence duration and absence frequency. Job enlargement and high skill variety on the other hand lead to increased job satisfaction, lower sickness absence and better role breadth self-efficacy.

However, when the evidence for skill discretion is considered in relation to health outcomes, two studies found no significant relationships between skill discretion and cardiovascular health, respiratory health, health insurance claims and self-reported psychiatric disorder. One study found that both men and women who reported low variety and use of skills were also more likely to report symptoms of psychiatric disorder.

### **4.7 Control: Decision authority**

#### **What is the evidence for the impact of exposure to the stressors grouped under decision authority?**

In the HSE framework, the stressor decision authority is conceptualised as: perceived control over work; externally imposed pace; and autonomy (need to take initiative).

##### **4.7.1 Number of papers and samples**

In total, 19 papers were reviewed which provided evidence for the specific aspects of decision authority covered by the HSE framework. Details of these papers are summarised in Tables 4.13 (work-related outcomes) and 4.14 (health-related outcomes). Of these, five were meta-analyses, six were based on UK samples, three on US samples, two on Australasian samples, two on other European samples, and one a mixed sample from US and Sweden. Two of the papers were based on samples drawn from general populations, whilst the other were based on specific occupation groups: five from the manufacturing sector, three samples of health care workers, and four of civil servants (three of which were based on the same study's sample).

### **4.7.2 Study design**

There was moderate variation in the design of studies providing evidence in this area. Aside from the meta-analyses there were 11 cohort studies, two studies reporting on a robust quasi-experimental group design, one between-subjects groups studies and one study of non-equivalent groups. Follow-up periods ranged from nine months to 11.5 years.

### **4.7.3 Measures of decision authority**

Measures of decision authority were largely self-report in nature and focussed on participative decision making, decision latitude, perceived influence and autonomy.

No objective measures were used.

### **4.7.4 Outcome measures**

A wide range of outcome measures were applied, both for work-related and health-related outcomes.

Subjective measures of work-related outcomes included self-reports of: job strain; safe working; intrinsic job satisfaction; extrinsic job satisfaction; organisational commitment; intrinsic job motivation; job satisfaction; performance; turnover intention; emotional exhaustion; depersonalisation; personal accomplishment; and involvement.

Objective measures of work-related outcomes included: sickness absence; work injuries; turnover; absence duration; and absence frequency.

Subjective measures of health outcomes included self-reports of: general health; physical functioning; social functioning; self-reported psychiatric disorder; back pain; neck pain; mental health; marital stress; alcohol related problems; exhaustion and depression; affective disorder; emotional distress.

No objective measures of health outcomes were included.

### **4.7.5 Findings and consistency of evidence: impact of decision authority on work-related outcomes**

Twelve papers provided evidence about the impact of decision authority on work-related outcomes (see Table 4.13).

## Meta-analyses

Four meta-analyses provide largely consistent results for the degree of association between decision authority and work-related outcomes.

The largest of these (292), giving a sample size of up to 17,895, found positive associations between both autonomy and participation with: general satisfaction; commitment; involvement; performance; and motivation. Negative associations were observed for both participation and autonomy with: absenteeism; intention to quit; and turnover.

The paper presented results for control measures combined, and for autonomy and participation separately. For all control studies taken together, all outcome variables were correlated with control. The smallest relationships were with measures of withdrawal behaviours (small negative relationships with intention to quit, turnover and absenteeism). Small positive relationships were also found with three aspects of job satisfaction (pay, promotion and co-workers).

The strongest relationships were with job involvement and four aspects of job satisfaction (overall satisfaction, work satisfaction, supervision and growth). Strong relationships were also identified with role ambiguity and role conflict.

The results for autonomy studies alone were very similar to those of control measures combined, with the only difference of note being a significantly smaller correlation with job involvement. The results for participation show more and bigger differences than those for control measures combined, *eg* absenteeism was not correlated with participation, and the pattern of correlations were not all the same. Those with higher participation also report less role ambiguity and conflict, are absent less, have fewer intentions of quitting, and are less likely to quit.

A second meta-analysis (285) found that autonomy was associated with high levels of job satisfaction.

A third meta-analysis (186) looked at differences in job status, task autonomy and absence duration and frequency. Absence frequency was not associated with task autonomy. However, absence duration was found to be significantly negatively associated with task autonomy in high status jobs, but not in low status jobs. In other words, those with high levels of task autonomy in high status jobs were likely to be away from work for shorter spells when they went absent.

A final meta-analysis (233) explored the relationships between autonomy and participation with emotional exhaustion, depersonalisation, and personal accomplishment. There was found to be no association between autonomy and the three

outcome variables. However, low participation was found to be significantly associated with both higher levels of emotional exhaustion and depersonalisation, though not associated with levels of personal accomplishment.

### **Individual papers**

Individual papers providing evidence for the causal direction of association between decision authority and work-related outcomes presented a somewhat more mixed picture.

Two studies of manufacturing employees in the UK (82) and Australia (148) both report non-significant lagged relationships between autonomy and safe working (UK sample) or work injuries (Australian sample). The UK sample did, however, find a contemporaneous effect, suggesting that autonomy does affect safe working. A study of healthcare workers in the Netherlands found that job autonomy was not related to job satisfaction, job motivation or emotional exhaustion.

Studies of the slightly more specific measures of decision latitude and participative decision making found a different pattern of results. In a sample of UK manufacturing employees (178), participative decision making was found to reduce job strain over an 18 month period.

Low decision making was not related to self-reported mental health in a large sample of UK Civil servants (236) over a five year period. In men, however, high decision-making was associated with reduced risk of taking short spells of sickness absence. In women, high decision authority did not protect against risk of taking sickness absence

A further study of UK Civil servants (36) randomly assigned to different working conditions found that those in the groups that reported higher decision latitude also reported higher self assessed performance and had lower absence records over a 12 month period, although decision latitude was unrelated to job satisfaction.

A study of hospital employees (193), which examined the effects of increased participation in decision-making through scheduled staff meetings at least twice per month, found that high participation had a direct effect on perceived influence and had a direct positive relationship with job satisfaction and a negative relationship with intention to leave. However, increased participation was found to have no direct or indirect relationship with emotional stress. Perceived influence in turn was related to increased job satisfaction and reduced turnover intention.

A study of the introduction of autonomous working in an Australian engineering workshop (251) compared those in

autonomous jobs and those who remained in non-autonomous jobs. It found that for those still working in non-autonomous jobs there were decreases in motivation, job satisfaction and productivity, significant increases in accidents, absence severity and absence frequency, but no change in turnover.

**Table 4.13: Evidence for the impact of decision authority on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
178	non-equivalent grps	18m	Vehicle manuf. employees	UK	perm. contracts at T1 and T2	332	Y	participative decision-making <sup>1</sup>	job strain <sup>1</sup>	r=-.18
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	high decision latitude <sup>1</sup>	short spells of psychiatric sickness absence <sup>2</sup>	RR=0.89 in men, RR=1.34 in women
148	cohort	12m	Manuf. employees	Australasia	—	362	N	autonomy <sup>1</sup>	work injuries <sup>2</sup>	not significant
82	cohort	18m	Manuf. employees	UK	—	161	Y	job autonomy <sup>1</sup>	safe working <sup>1</sup>	not significant
36	between-subjects, 6 units of the dept.	12m	Employees of central govt. dept	UK	random assignmt to PAR or non-PAR	53	Y	decision latitude <sup>1</sup>	job satisfaction <sup>1</sup> performance <sup>1</sup> absence <sup>2</sup>	not significant significant <sup>3</sup> significant <sup>3</sup>
193	Solomon 4 group design	9m	Employees of hospital dept.	US	random assignmt to decision-making meetings or none	70	Y	perceived influence <sup>1</sup>	job satisfaction <sup>1</sup> absenteeism <sup>2</sup> turnover intention <sup>1</sup>	r=.31 not significant r=.50
251	Solomon 4 group design	10m	Workforce of engineering workshop	Australasia	random assignmt to autonomous or non-autonomous	327	Y	non-autonomous working <sup>1</sup>	job motivation job satisfaction productivity accidents turnover absence severity absence freq.	significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup> not significant significant <sup>3</sup> significant <sup>3</sup>
153	cohort	24m	Health care workers	Netherlands	—	261	Y	job autonomy <sup>1</sup>	job satisfaction <sup>1</sup> job motivation <sup>1</sup> emotl exhaustion <sup>1</sup>	not significant not significant not significant
233	meta-analysis	—	11 samples 11 11 6 samples 5 6	—	—	2,177 2,177 2,177 1,763 1,346 1,763	—	autonomy  participation	emotl exhaustion depersonalisation personal accompt emotl exhaustion depersonalisation personal accompt	not significant not significant not significant r=-.31 r=-.17 not significant

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
186	meta-analysis	—	2 samples	—	—	823	—	task autonomy in high status jobs	absence duration	r=-.41
			4			2,610		task autonomy in low status jobs	absence duration	not significant
			7			3,813		task autonomy	absence freq.	not significant
285	meta-analysis	—	—	—	—	—	—	autonomy	job satisfaction	r=.46
292	meta-analysis	—	44 samples	—	—	17,895	—	autonomy	general satisfaction	r=.37
			6			702			commitment	r=.28
			6			2,334			involvement	r=.23
			6			1,361			absenteeism	r=-.23
			18			6,291			performance	r=.26
			11			1,667			intention to quit	r=-.26
			7			7,283			turnover	r=-.25
			13			4363			motivation	r=.33
			17 samples			3,201		participation	general satisfaction	r=.44
			2			184			commitment	r=.43
			5			5,866			involvement	r=.65
			1			87			absenteeism	r=-.01
			6			1,343			performance	r=.23
			4			1,451			intention to quit	r=-.20
			3			358			turnover	r=-.38
			2			3041			motivation	r=.43

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- 186 Farrell D, Stamm C L (1988), 'Meta-Analysis of the Correlates of Employee Absence', *Human Relations*, Vol. 41, pp. 211-227
- 285 Loher B T, Noe R A, Moeller N L, Fitzgerald M P (1985), 'A Meta-Analysis of the Relation of Job Characteristics to Job Satisfaction', *Journal of Applied Psychology*, Vol. 70, No. 2, pp. 280-289
- 292 Spector P E (1986), 'Perceived Control by Employees: A Meta-Analysis of Studies Concerning Autonomy and Participation at Work', *Human Relations*, Vol. 39, No. 11, pp. 1005-1016

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

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Source: IES 2002



#### **4.7.6 Findings and consistency of evidence: impact of decision authority on health outcomes**

Ten papers provided evidence about the impact of decision authority on health-related outcomes (see Table 4.14).

##### **Meta-analyses**

One of the meta-analyses (292) contained information about the impact of decision authority on health-related outcomes. The results showed that both autonomy and participation were associated with physical symptoms and emotional distress. The strongest relationships were between lower autonomy, and higher levels of physical symptoms and emotional distress. Participation was associated with lower reporting of physical symptoms and slightly reduced emotional distress. These results should be considered in light of small sample sizes for many of the variables. Overall, employees who perceive more control at work report fewer physical and emotional symptoms.

##### **Individual papers**

###### *Decision latitude and physical health*

A general population study conducted in Denmark (320) over a five year period, which looked specifically at decision authority, found that it was not a significant predictor of self-reported health. A similar non-significant result was found in employees of a central government department.

A paper reporting findings of a study of over 10,000 Civil servants (407) found that low decision latitude was related to increased risk of poor physical functioning at the five year follow-up in both men and women. However, when the results were adjusted for illness, age, employment grade and negative affectivity, these relationships became non-significant.

A study of US hospital employees over two years (97) found that on average all the health measures worsened significantly. For individual employees, a decrease in job influence significantly predicted worse general health, increased back pain and increased neck pain.

###### *Decision latitude and mental health*

Research on a small sample of UK civil service employees (36) randomly assigned to different job conditions, found that decision latitude was unrelated to physical health, but was significantly related to mental health. In addition, a study of US non-managerial staff found a significant relationship between decision

latitude and alcohol-related problems, but no relationship with symptomology or affective disorder.

A general population study in the US and Sweden (310) found significant relationships between decision latitude and both exhaustion and depression.

A large survey of UK Civil servants (408) found that low decision latitude was significantly associated with poor general mental health in both men and women. After additional adjustment for smoking, exercise, and body mass index (BMI), the effects of low decision latitude were associated with poor mental health in men but not in women.

A second paper (407) reporting on the same survey found that for decision latitude there was a small increased likelihood of psychiatric disorder in men, but not in women, after controlling for illness, age, employment grade and negative affectivity.

A third paper from the same survey (236) found that low decision latitude was unrelated to psychiatric disorder in men or women in a fully adjusted model controlling for age, grade, work characteristics and baseline psychiatric disorder.

#### *Autonomy and mental health*

Research in a small sample of UK manufacturing employees (244) found that self-reported autonomy was a significant predictor of self-reported mental health six months on. The study examined the impact of changing to new working practices with and without participation. Results showed that there were significant increases in strain and workload for those who changed to the new system without participation. However, those who changed to the new system with participation showed no increase in mental ill-health. Autonomy was found to be the most important work characteristic in predicting changes in levels of strain.

**Table 4.14: Evidence for the impact of decision authority on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
320	cohort	5yrs	General popn	Denmark	—	5,001	Y	decision authority <sup>1</sup>	health <sup>1</sup>	not significant
407	cohort	4yrs	Civil servants	UK	—	10k+	Y	decision latitude <sup>1</sup>	physical functioning <sup>1</sup> mental health <sup>1</sup> social functioning <sup>1</sup>	not significant OR=1.55 in men, not sig. in women not significant
408	cohort	4yrs	Civil servants	UK	—	10k+	Y	decision latitude <sup>1</sup>	psychiatric disorder <sup>1</sup>	OR = 1.29 in men, OR=1.37 in women
97	cohort	2yrs	Hospital employees	US	—	422	Y	decision latitude <sup>1</sup>	general health <sup>1</sup> back pain <sup>1</sup> neck pain <sup>1</sup>	R2=.01 R2=.01 R2=.02
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	low decision latitude <sup>1</sup>	psychiatric disorder <sup>1</sup>	not significant
244	cohort	6m	Assembly line of car manuf.	UK	—	38	Y	autonomy <sup>1</sup>	mental health <sup>1</sup>	r2=.23
36	between-subjects, 6 units of the dept.	12m	Employees of central govt. dept	UK	random assign to condition	53	Y	decision latitude <sup>1</sup>	physical health <sup>1</sup> mental health <sup>1</sup>	not significant significant <sup>3</sup>
310	cohort	6yrs	General popn	US and Sweden	—	950+	Y	decision latitude <sup>1</sup>	exhaustion <sup>1</sup> depression <sup>2</sup>	significant <sup>3</sup> significant <sup>3</sup>
247	cohort	12m	Non-managerial staff in 4 power plants	US	—	325	Y	decision latitude <sup>1</sup>	alcohol-related problems <sup>1</sup> symptomology <sup>1</sup> affective disorder <sup>1</sup>	log odds = 0.15 not significant not significant
292	meta-analysis	—	6 samples 6	—	—	1,228 1,083	—	autonomy	physl symptoms emotional distress	r=-.33 r=-.37
			3 samples 4			213 300		participation	physl symptoms emotional distress	r=-.34 r=-.18

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<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

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Source: IES 2002

### **4.7.7 Effect sizes**

In meta-analyses, the mean correlations were relatively large, with more than half of them over 0.4 (moderate). Correlation coefficients of individual papers ranged from .18 to .50 (small to moderate), small  $R^2$  statistics were reported in one study (.01 and .02), whilst odds ratios ranged from 1.20 to 1.55 (small).

### **4.7.8 Summary**

The findings on decision authority as an independent cause of adverse outcomes are fairly mixed. This is not surprising given the wide variety of methodologies and measures which are being drawn together under this section. Additionally, most research which could be considered to provide evidence on decision authority, forms part of the wider work on decision latitude and control generally. Much work in this area is designed to test Karasek's job demands/control/support model, so is more concerned with the identification of interaction rather than main effects for decision authority.

Overall, general measures of autonomy, although highly associated with work-related outcomes in the meta-analyses, appeared to be less relevant in predicting significant negative findings for many of the work-related outcomes. However, where health-related outcomes were reported, autonomy seemed an important factor in reports of both physical and mental health problems.

Slightly more specific measures based on decision latitude tended to provide a much clearer pattern of relationships with work-related outcomes, with high decision latitude being an important correlate of job satisfaction, self-rated performance and objectively measured absence. Decision latitude measures were equally important in predicting mental and physical health outcomes.

Overall, it appears that decision latitude is a more sensitive measure than general measures of autonomy, in understanding the specific work characteristics which determine poor work-related and health-related outcomes.

## **4.8 Control: Other forms of control**

### **What is the evidence for the impact of exposure to the stressors grouped under other forms of control?**

This category was added to the existing HSE framework at the start of the sifting and reviewing process. The purpose was to be inclusive as possible in our approach to the literature, and to ensure that research on other forms of control which fell outside the HSE framework definition was available for review.

Research fell into this category primarily for the straightforward reason that the measure of control used was too generic to be identified as either decision authority or skill discretion as defined in the HSE framework.

#### **4.8.1 Number of papers and sample**

In total, 21 additional papers were identified which contained evidence on the impact of other forms of control. Details of these papers are summarised in Tables 4.15 (work-related outcomes) and 4.16 (health-related outcomes). Two of the studies were based on US samples; 14 on UK samples; one on an Australasian sample and three on other European samples.

#### **4.8.2 Study design**

Eighteen of these papers were based on cohort studies and two were based on diary studies. Follow-up periods ranged from six weeks to over four years in the cohort studies. The diary studies were conducted over periods of two and four weeks respectively. One of the studies was a meta-analysis.

#### **4.8.3 Measures of control**

These were largely subjective in nature and included: amount of control; low control; control; control over work schedule; control over work; task control; job control; method and timing control; and uncertainty.

The only objective measures of control identified were operator control, and externally assessed job control.

#### **4.8.4 Outcome measures used**

Subjective measures of work-related outcomes included: job satisfaction; job performance; work stress; depersonalisation; role breadth self-efficacy; job strain; and intrinsic and extrinsic job satisfaction.

Objective measures of work-related outcomes included: short spells of sickness absence; long spells of sickness absence; short and long absence due to back pain; absence rate; absence frequency; amount of downtime; incidence of downtime and system performance.

Subjective measures of health-related outcomes included: illness complaint, psychiatric disorder; well-being; tension-anxiety; depression; daily life stress; physical health; heart disease; cardiovascular health; respiratory health; mental health; emotional exhaustion; negative mood; reports of symptoms of heart disease – angina pectoris, severe chest pains, and ischaemia.

Objective measures of health outcomes included: blood pressure; salivary cortisol; health insurance claims.

#### **4.8.5 Findings and consistency of evidence: impact of other forms of control on work- related outcomes**

Thirteen papers contributed evidence to the impact of other forms of control on work-related outcomes (see Table 4.15).

The measures of control in the papers reviewed could be separated into four types as follows:

- general measures of control (amount of control, low control, job control)
- measures of operator control
- control over specific aspects of the job (work schedule, work, method and timing control, task control), and
- uncertainty about organisational changes.

To aid interpretation, results are presented in the same format.

#### **Meta-analyses**

No meta-analyses were identified.

#### **Individual papers**

##### *General measures of control and work-related outcomes*

Six studies explored the relationship between general measures of control and work-related outcomes. On the whole, these papers reveal largely significant findings with a range of outcome measures, although three of the papers found mixed results for the impact of control on different work-related outcomes.

A small study of nurses in the US (306) found that amount of control was related to job satisfaction, but not job performance. A large study of UK civil servants found subjectively measured high job control was significantly predictive of higher global satisfaction in women and men over a four year period. However, an objective measure of high control was only significantly related to satisfaction in women.

A paper based on the large survey of UK civil servants (403) found that low control considerably increased the risk for both men and women, of short and long spells of sickness absence. A second paper based on this sample (406) concentrated on predictors of short and long absence due to back pain. Low control was found to significantly increase the risk of short

absences due to back pain (but only for the men in the sample), but not to increase the risk of long absence due to back pain.

A further two papers looked at the relationship between self-reported job control and objectively measured absence figures. A study of 1,755 technical maintenance employees in the Netherlands (191) found that low job control was significantly related to absence rate over a three year period, although it did not affect frequency of absence. The second study of 812 local government employees in Finland (199) found that low job control significantly increased the risk of sickness absence over a three year period.

#### *Operator control and work-related outcomes*

Two studies explored the more specific concept of operator control. These studies, both of very small samples looked at a mixture of subjective and objective work-related outcomes over a large number of shifts.

The first study focussed on operator control objectively defined by type of machine (202). Work on two types of machine were studied, high variance machines which were particularly prone to operational error, and low variance machines which required considerably less human support. The operators of the machines were given training aimed at increasing their control over both of them. The change to operator control was found to be associated with a reduction in the amount of downtime for high variance machines, but not a reduction in the incidence of downtime. So operator control seems to reduce the amount of time taken to deal with operational problems rather than prevent them. The work redesign showed no effects on extrinsic job satisfaction, or job-related strain. However, there was an increase in intrinsic job satisfaction and a decrease in perceived job pressure. The authors advise caution on imposing a causal interpretation of a work design effect on psychological well-being, as it may reflect the effect of the training programme or other general improvements.

The second study examined data for four employees over an eight month period (201) which encompassed periods of low and high operator control. Performance was higher after the increase in job control than in any period before. There were also more short stoppages after increasing control. This sheds light on how the operators increased uptime, by making more short stoppages that led to fewer long stoppages. There were significant reductions in longer stoppages.

#### *Specific measures of control and work-related outcomes*

A UK general population cohort study (364) found large significant associations between low control over work schedule and self-reported work stress 18 months on, but not for control over work decisions.



A study of university clerical workers (392) over a six week period found that task control was a positive predictor of job satisfaction, but not of depersonalisation or performance.

A study of UK manufacturing employees (197) over an 18 month period found that changes in organisational features predicted change in role breadth self-efficacy. Task control was the most important predictor of change in self-efficacy. The greater the increase in task control, the more likely was an increase in self-efficacy.

The specific aspects of method and timing control were studied in 139 employees of a chemical processing company (73) over a four year period. Increases in method and timing control resulted in increased job satisfaction, but were not associated with strain.

#### *Uncertainty and work-related outcomes*

The impact of uncertainty about organisational change amongst employees of a regional water authority (34) was studied over an 18 month period. Data were collected for managers, staff and manual workers at three time points as the organisation underwent major change. The findings indicate that those who are in less control (staff and manual workers), and those who experience higher uncertainty, suffer the greatest negative effects of major organisational change.

**Table 4.15: Evidence for the impact of other forms of control on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
306	cohort	2m	Full-time nurses	US	—	136	N	amount of control <sup>1</sup>	job satisfaction <sup>1</sup> job performance <sup>1</sup>	r=.46 not significant
403	cohort	4yrs	Civil servants	UK	—	10k+	Y	low control <sup>1</sup>	short spells of sickness absence <sup>2</sup> long spells of sickness absence <sup>2</sup>	OR= 1.58 for men, OR=1.21 for women OR=1.54 for men, OR=1.52 for women
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	control <sup>1</sup> control <sup>2</sup>	satisfaction <sup>1</sup> satisfaction <sup>1</sup>	significant <sup>3</sup> significant in women only
406	cohort	4yrs	Civil servants	UK	—	10k+	Y	low control <sup>1</sup>	short absence due to back pain <sup>2</sup> long absence due to back pain <sup>2</sup>	RR=1.44 in men, not significant in women not significant in men or women
364	cohort	12m	General popn	UK	—	1.8k	N	control over work schedule <sup>1</sup> control over work <sup>1</sup>	work stress <sup>1</sup>	significant <sup>3</sup> not significant
392	cohort	6wks	University clerical workers	Australasia	—	80	N	task control <sup>1</sup>	job satisfaction <sup>1</sup> depersonalisation <sup>1</sup> performance <sup>1</sup>	significant <sup>3</sup> not significant not significant
191	cohort	3yrs	Employees of technical maintenance firm	Netherlands	—	1,755	N	job control <sup>1</sup>	absence rate <sup>2</sup> absence freq. <sup>2</sup>	significant <sup>3</sup> not significant
197	cohort	18m	Employees of vehicle manuf.	UK	—	778	Y	task control <sup>1</sup>	role breadth self-efficacy <sup>1</sup>	significant <sup>3</sup>
199	cohort	3yrs	Local govt employees	Finland	—	812	Y	job control <sup>1</sup>	sickness absence <sup>2</sup>	RR=1.62
73	cohort	4yrs	Chemical processing company	UK	—	139	Y	method and timing control <sup>1</sup>	job satisfaction <sup>1</sup> job strain <sup>1</sup>	significant <sup>3</sup> not significant
202	cohort	4m	Large electronics company	UK	—	19	Y	operator control <sup>2</sup>	amount of downtime <sup>2</sup> incidence of downtime <sup>2</sup> intrinsic job satis. <sup>1</sup> extrinsic job satis. <sup>1</sup> job pressure <sup>1</sup>	significant <sup>3</sup> not significant significant <sup>3</sup> not significant significant <sup>3</sup>
201	cohort	8m	Engineering plant	UK	—	4	N	operator control <sup>2</sup>	system performance <sup>2</sup>	significant <sup>3</sup>
34	cohort	13m	Regional water authority	UK	—	397	Y	uncertainty <sup>1</sup>	job satisfaction <sup>1</sup>	significant <sup>3</sup>

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<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

#### **4.8.6 Findings and consistency of evidence: impact of other forms of control on health outcomes**

Eleven papers provided evidence on the impact of other forms of control on health-related outcomes (see Table 4.16).

##### **Meta-analyses**

The meta-analysis (500) found a correlation of .21 between job control measures and health outcomes.

##### **Individual papers**

The majority of studies looking at the health-related outcomes used more general measures of control.

##### *General control and health-related outcomes*

US full-time nursing staff (306) studied over a two year period were found to be more likely to complain of illness in conditions of low control, but that job control was not significantly related to blood pressure or salivary cortisol.

A large survey of UK civil servants (404) used both subjective and objective measures of work characteristics to explore the relationship between control and health outcomes. The external assessments of high control (measured by personnel managers' perceptions of jobs) were not associated with well-being in either men or women, but led to improved psychological health outcomes in men (*ie* better mental health). The subjective measures of high control were significantly associated with improved mental health and well-being in men and women.

A paper based on the same study (38) found that both men and women with self-reported low job control were more at risk of developing new CHD, compared with participants with high control. Similar results were found with externally assessed job control, suggesting that both subjective and objective measures were reliable ways of assessing risk in relation to possible new CHD.

A third paper (303) from this study also found that high job control significantly reduced the report of symptoms of heart disease in both men and women.

A five year study of nursing staff in the US (42) found that levels of job control were significant predictors for cardiovascular health, but not for respiratory health and health insurance claims.

One study was unable to analyse the results fully (59) because statistical assumptions were not met by the data.

Four other studies found non-significant results between control and uncertainty and various outcomes such as well-being, mental health and physical health.

**Table 4.16: Evidence for the impact of other forms of control on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
306	cohort	2m	Full-time nurses	US	—	136	N	amount of control <sup>1</sup>	illness complaint <sup>1</sup> blood pressure <sup>2</sup> salivary cortisol <sup>2</sup>	r=-.32 not significant not significant
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	low control <sup>1</sup> low control <sup>2</sup>	psychiatric disorder <sup>1</sup> well-being <sup>1</sup> psychiatric disorder <sup>1</sup> well-being <sup>1</sup>	OR=1.31 in men, OR=1.39 in women significant <sup>3</sup> not significant not significant
59	cohort	12m	Office workers	US	—	136	N	control <sup>1</sup>	tension-anxiety <sup>1</sup> depression <sup>1</sup> daily life stress <sup>1</sup> physical health <sup>1</sup>	not tested not tested not tested not tested
38	cohort	5yrs	Civil servants	UK	—	10k+	Y	low self-reported job control <sup>1</sup> externally assessed control <sup>2</sup>	heart disease <sup>1</sup>	OR=1.55 for men, OR=1.87 for women OR=1.49 for men, OR=1.76 for women
42	cohort	5yrs	Nurses	US	—	90		control <sup>1</sup>	cardio. health <sup>1</sup> respiratory health <sup>1</sup> health insurance claims <sup>2</sup>	significant <sup>3</sup> not significant not significant
380	diary study	2wks	School teachers	Netherlands	—	100	N/A	control <sup>1</sup>	well-being <sup>1</sup>	not significant
202	cohort	4m	Large electronics company	UK	—	19	Y	operator control <sup>2</sup>	mental health <sup>1</sup>	not significant
102	within-subjects, diary study	4wks	Accounts dept.	UK	within-subjects	7	N/A	control <sup>1</sup>	emotl exhaustion <sup>1</sup> negative mood <sup>1</sup>	not significant significant <sup>3</sup>
303	cohort	5yrs 4ms	Civil servants	UK	—	10k+	Y	control <sup>1</sup>	angina pectoris <sup>1</sup> severe chest pain <sup>1</sup> ischaemia <sup>1</sup>	significant <sup>3</sup> significant <sup>3</sup> significant <sup>3</sup>
34	cohort	13m	Regional water authority	UK	—	397	Y	uncertainty <sup>1</sup>	mental health <sup>1</sup> physical health <sup>1</sup>	not significant not significant
500	meta-analysis	—	—	—	—	—	—	job control	health outcomes	r = .21

References:

306 Fox M L, Dwyer D J, Ganster D C (1993), 'Effects of Stressful Job Demands and Control on Physiological and Attitudinal Outcomes in a Hospital Setting', *Academy of Management Journal*, Vol. 36, No. 2, pp. 289-318

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<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

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Source: IES 2002

### **4.8.7 Effect sizes**

Very few effect sizes were reported by the papers providing evidence. Those that were reported were relatively small, odds ratios and rate ratios ranging between 1.21 and 1.87.

### **4.8.8 Summary**

The evidence relating to the other forms of control examined here is fairly consistent. Low control is related to work-related outcomes such as lower job satisfaction, increased sickness absence and lower performance measures. It is also related to some measures of mental health and physical health symptoms. However, there were a number of non-significant findings in the research reviewed which suggest that either the relationship is a complex one, or that the relationships are relatively small and some non-significant results are, therefore, to be expected.

## **4.9 Support: (Lack of) support What is the evidence for the impact of exposure to the stressors grouped under (lack of) support?**

In the HSE framework, the stressors grouped under support are subdivided into proactive and reactive support. Both categories are conceptualised as having the following elements: practical and emotional support; work and non-work support; support from managers; support from colleagues; and lack of recognition or feedback. Additionally, lack of appropriate reactive support includes an absence of organisational support (such as an Employee Assistance programme).

No papers were identified that could be seen to offer evidence on reactive support. Most focused on social support from managers and peers, so for the purposes of the review we have re-defined the support category to reflect this.

### **4.9.1 Number of papers and samples**

In total, 18 papers were reviewed that provided evidence on the impact of social support or lack of it. Details of these papers are summarised in Tables 4.17 (work-related outcomes) and 4.18 (health-related outcomes). Of these, nine were based on UK samples; one was based on a US sample; two on Australasian samples; two on other European samples; and three were meta-analyses. Two of the papers were based on samples drawn from general populations, three samples were from manufacturing or industrial organisations, one was a sample of clerical workers, and eight were samples of civil servants (seven of which were based on the same large study).



## **4.9.2 Study design**

Fourteen of the papers reviewed were cohort studies, ranging in follow-up period from six weeks to five years, and four were meta-analyses.

## **4.9.3 Measures of support**

Measures of support (or lack of it) were all subjective in type. The focus varied only slightly and covered low support at work; general support at work; supervisor support; co-worker support; non-work support; feedback; participation (cognitive); participation (motivational); low emotional support; low practical support; and deterioration in support at work.

## **4.9.4 Outcome measures used**

Outcome measures largely consisted of self reports. However, five studies included objective work-related outcome measures.

Subjective measures of work-related outcomes included: satisfaction; work stress; job satisfaction; depersonalisation; performance; intention to leave; safe working; and performance satisfaction.

Objective measures of work-related outcomes included: short spells of sickness absence; long spells of sickness absence; short absence due to back pain; long absence due to back pain; and work injuries.

Subjective measures of health outcomes included: psychiatric disorder; well-being; physical functioning; mental health; social functioning; emotional exhaustion, depersonalisation and personal accomplishment.

## **4.9.5 Findings and consistency of evidence: impact of (lack of) support on work-related outcomes**

Eleven papers provided evidence on the impact of support on work-related outcomes (see Table 4.17).

### **Meta-analyses**

Both meta-analyses provided strong evidence for the impact of various forms of support at work. One meta-analysis (285) focussed on feedback and found that it was associated with higher levels of job satisfaction.

The second meta-analysis (161) reviewed evidence on two forms of participation that involved increased levels of support,

feedback and communication: cognitive participation and motivational participation. Participation within the cognitive framework included information exchange and processing between supervisor and subordinate. Findings suggested that increased information and understanding leads to better performance and satisfaction. Participation within the motivational framework focussed more, for instance, on convincing people to take action or to agree on a particular choice. Findings for motivational participation indicated that increased commitment, trust and control leads to better performance and satisfaction.

There was no difference in the relationship between participation and performance for the two conceptual frameworks, but a difference was identified with the relationship between participation and satisfaction. This suggested that cognitive/information-processing approaches to participation may lead to more satisfaction than motivational participation.

### **Individual papers**

Nine further papers provide evidence on the impact of support, and the findings reveal a somewhat mixed picture.

Two of the studies that looked at the impact of low support, generally found significant relationships with both self-reported satisfaction and self-reported work stress. One of the studies, a general UK population study (364) with a twelve month follow-up period, showed that reports of low support at time one were significantly associated with self reports of work stress twelve months on. However, these findings are based on an unknown analysis and no statistics are presented.

Three papers published from the same study of UK civil servants looked at the impact of support on both spells of sickness absence and absence due to back pain. One study (403) found that men and women who rated their jobs as low in social support at work had higher rates of objectively measured short and long spells of general absence, compared to those who rated support as high. Correspondingly, a second paper (236) demonstrated that high support from managers reduced the risk of sickness absence in men and women, whilst high support from co-workers reduced the risk in men only. However, the impact of low support was non-significant when spells of absence due to back pain were considered in the third paper (406).

A further non-significant result was found between social support and sickness absence in a study of Finnish civil servants (199).

One paper (392) focused on the question of which type of support (supervisor, co-worker or non-work) interacts with workload and control to influence job satisfaction, depersonalisation and

performance. Findings for impact show that co-worker support predicted job satisfaction and that non-work support predicted depersonalisation. Different forms of support were thus important in relation to different work outcomes. Supervisor support was not found to be predictive of job satisfaction, depersonalisation or performance.

Finally, two studies of manufacturing employees examined the impact of support on safe working and injuries. One study, based on a Australian sample (148), found fewer work injuries with high levels of co-worker support and supervisor support. The UK based study (82) similarly found that supportive supervision led to safer working.

**Table 4.17: Evidence for the impact of support on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
403	cohort	4yrs	Civil servants	UK	—	10k+	Y	low support at work <sup>1</sup>	short spells of sickness absence <sup>2</sup> long spells of sickness absence <sup>2</sup>	OR=1.26 in men, OR=1.06 in women OR=1.07 in men, OR=1.07 in women
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	low support at work <sup>1</sup>	satisfaction <sup>1</sup>	significant <sup>3</sup>
406	cohort	4yrs	Civil servants	UK	—	10k+	Y	support at work <sup>1</sup>	short absence due to back pain <sup>2</sup> long absence due to back pain <sup>2</sup>	not significant not significant
364	cohort	12m	General popn	UK	—	1.8k	N	lack of proactive support <sup>1</sup>	work stress <sup>1</sup>	significant <sup>3</sup>
392	cohort	6wks	University clerical workers	Australasia	—	80	N	supervisor support <sup>1</sup>	job satisfaction <sup>1</sup> depersonalisation <sup>1</sup> performance <sup>1</sup>	not significant not significant not significant
								co-worker support <sup>1</sup>	job satisfaction <sup>1</sup> depersonalisation <sup>1</sup> performance <sup>1</sup>	significant <sup>3</sup> not significant not significant
								non-work support <sup>1</sup>	job satisfaction <sup>1</sup> depersonalisation <sup>1</sup> performance <sup>1</sup>	not significant significant <sup>3</sup> not significant
285	meta-analysis	—	—	—	—	—	—	feedback	job satisfaction	r=.41
161	meta-analysis	—	34 58	—	—	4,025 12,689	—	participation (cognitive framework)	performance satisfaction	r=.22 r=.32
			21 11			1,262 896		participation (motivational framework)	performance satisfaction	r=.17 r=.12 (p=.06)
199	cohort	3yrs	Local government employees	Finland	—	812	Y	social support <sup>2</sup>	medically certified absence <sup>2</sup>	not significant
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	high support from supervisors <sup>1</sup> high support from co-workers <sup>1</sup>	short spells of psychiatric sickness absence <sup>2</sup>	RR=0.72 in men, RR=0.74 in women RR=0.80 in men, not significant in women
148	cohort	12m	Manuf. employees	Australasia	—	362	N	co-worker support <sup>1</sup> supervisor support <sup>1</sup>	work injuries <sup>2</sup>	r= -.27 r= -.27
82	cohort	18m	Manuf. employees	UK	—	161	Y	supportive supervisor <sup>1</sup>	safe working <sup>1</sup>	significant <sup>3</sup>

## References:

- 403 North F, Syme S L, Feeney A, Head J, Shipley M J, Marmot M G (1993), 'Explaining Socioeconomic Differences in Sickness Absence: The Whitehall II Study', *British Medical Journal*, Vol. 306, pp. 361-366
- 404 Stansfeld S A, North F M, White I, Marmot M G (1995), 'Work Characteristics and Psychiatric Disorder in Civil Servants in London', *Journal of Epidemiology and Community Health*, Vol. 49, pp. 48-53
- 406 Hemingway H, Shipley M J, Stansfeld S, Marmot M (1997), 'Sickness Absence from Back Pain, Psychosocial Work Characteristics and Employment Grade Among Office Workers', *Scandinavian Journal of Work and Environmental Health*, Vol. 23, pp. 121-129
- 364 Smith A, Johal S, Wadsworth E, Davey Smith G, Peters T (2000), *The Scale of Occupational Stress: The Bristol Stress and Health at Work Study*, Health & Safety Executive, Contract Research Report 265, HSE Books
- 392 Sargent L D, Terry D J (2000), 'The Moderating Role of Social Support in Karasek's Job Strain Model', *Work & Stress*, Vol. 14, No. 3, pp. 245-261
- 193 Jackson S E (1983), 'Participation in Decision Making as a Strategy for Reducing Job-Related Strain', *Journal of Applied Psychology*, Vol. 68, No. 1, pp. 3-19
- 285 Loher B T, Noe R A, Moeller N L, Fitzgerald M P (1985), 'A Meta-Analysis of the Relation of Job Characteristics to Job Satisfaction', *Journal of Applied Psychology*, Vol. 70, No. 2, pp. 280-289
- 161 Wagner J A, Leana C R, Locke E A, Schweiger D M (1997), 'Cognitive and Motivational Frameworks in US Research on Participation: A Meta-Analysis of Primary Effects', *Journal of Organizational Behavior*, Vol. 18, pp. 49-65
- 199 Kivimäki M, Vahtera J, Thomson L, Griffiths A, Cox T, Pentti J (1997), 'Psychosocial Factors Predicting Employee Sickness Absence During Economic Decline', *Journal of Applied Psychology*, Vol. 82, No. 6, pp. 858-872
- 236 Stansfeld S A, Fuhrer R, Head J, Ferrie J, Shipley M (1997), 'Work and Psychiatric Disorder in the Whitehall II Study', *Journal of Psychosomatic Research*, Vol. 43, No. 1, pp. 73-81
- 148 Iverson R D, Erwin P J (1997), 'Predicting Occupational Injury: The Role of Affectivity', *Journal of Occupational and Organizational Psychology*, Vol. 70, pp. 113-128
- 82 Parker S K, Axtell C M, Turner N (2001), 'Designing a Safer Workplace: Importance of Job Autonomy, Communication Quality, and Supportive Supervisors', *Journal of Occupational Health Psychology*, Vol. 6, No. 3, pp. 211-228

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

#### **4.9.6 Findings and consistency of evidence: impact of (lack of) support on health outcomes**

Nine papers present information about the health impact of social support, three of which are based on the same study of over 10,000 UK civil servants (see Table 4.18).

##### **Meta-analyses**

One meta-analysis (233) examined the impact of three types of support on the three components of burnout. The results of the meta-analysis showed that high levels of general social support were significantly related to reduced levels of emotional exhaustion, but not depersonalisation or personal accomplishment. High levels of support from supervisors were related to lower levels of emotional exhaustion and depersonalisation, but not of personal accomplishment. Whilst high levels of support from co-workers were not related to personal accomplishment, they were significantly related to reduced levels of depersonalisation, but also to increased levels of emotional exhaustion.

The second meta-analysis (500) found a correlation of .24 between supervisor support and health outcomes.

##### **Individual papers**

A study based on a sample of the Danish general population (320) found that low social support increased the risk of poor self-reported health by 1.5 times.

Findings from a large study of civil servants (404) show that low social support at work was significantly related to poorer levels of well-being. Men who reported low social support were 1.5 times more likely to subsequently report psychiatric disorder; whilst women with low support were 1.4 times more likely to. Almost identical results for psychiatric disorder were reported from a second paper based on this study (236).

A third paper from this study looked at deterioration in social support at work (408). It found that for both men and women there was a significant increase in self-reported psychiatric disorder symptoms, with both men and women who report a deterioration in their work social support being 1.2 times more likely to report higher levels of psychiatric symptoms.

Another paper from this large UK study (407) focused on the impact of different kinds of support on physical, social and mental functioning. Low social support considered generally was found to be unassociated with physical functioning. However, men with low social support were 1.2 times more likely to report poor mental health symptoms than those with high social support, the

corresponding figure for women being 1.4 times more likely. Similarly, men with low social support were 1.2 times more likely to report an impact on their social functioning, although there was not a significant impact for women.

Low emotional support had no significant impact for women, but for men meant they were 1.2 times more likely to report lower physical functioning than those with high emotional support. Low emotional support also meant that men were 1.6 times more likely to report mental ill-health symptoms. There was no significant association with social functioning.

Low practical support was not significantly associated with physical or social functioning for either gender. It was significantly associated with poor mental health only in men, who were 1.3 times more likely to report mental ill-health symptoms if they also reported low practical support.

A final paper based on this sample (303) examined the impact of social support on three self-reported symptoms of heart disease, but found no significant effects.

Similarly, a study of non-managerial staff in US power plants (247) found no significant impact of co-worker support on either alcohol-related problems, symptomology and affective disorder.

**Table 4.18: Evidence for the impact of support on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
404	cohort	4yrs	Civil servants	UK	—	10k+	Y	low support at work <sup>1</sup>	psychiatric disorder <sup>1</sup> well-being <sup>1</sup>	OR=1.53 in men, OR=1.39 in women significant <sup>3</sup>
407	cohort	4yrs	Civil servants	UK	—	10k+	Y	low social support <sup>1</sup>  low emotional support <sup>1</sup>  low practical support <sup>1</sup>	physical functioning <sup>1</sup> mental health <sup>1</sup>  physical functioning <sup>1</sup> mental health <sup>1</sup>  social functioning <sup>1</sup> physical functioning <sup>1</sup> mental health <sup>1</sup>  social functioning <sup>1</sup>	not significant OR=1.20 in men, OR=1.37 in women OR=1.24 in men, not significant in women OR=1.24 in men, not significant in women OR=1.63 in men, not significant in women not significant not significant OR=1.33 in men, not significant in women not significant
408	cohort	4yrs	Civil servants	UK	—	10k+	Y	deterioration in social support at work <sup>1</sup>	psychiatric disorder <sup>1</sup>	OR=1.23 in men, OR=1.19 in women
320	cohort	5yrs	General popn	Denmark	—	5,001	Y	low social support <sup>1</sup>	health <sup>1</sup>	OR=1.53
236	cohort	5yrs	Civil servants	UK	—	10k+	Y	low social support <sup>1</sup>	psychiatric disorder <sup>1</sup>	OR=1.31 in men, OR=1.43 in women
247	cohort	12m	non-managerial staff in 4 power plants	US	—	325	Y	co-worker support <sup>1</sup>	alcohol-related problems <sup>1</sup> sympatomology <sup>1</sup> affective disorder <sup>1</sup>	not significant not significant not significant
303	cohort	5.3yrs	Civil servants	UK	—	10k+	Y	social support <sup>1</sup>	angina pectoris <sup>1</sup> severe chest pain <sup>1</sup> diagnosed ischemia <sup>1</sup>	not significant not significant not significant
233	meta-analysis	—	6 samples 7 7 13 12 13 14 13 15	—	—	1,010 1,176 1,176 3,589 3,172 3,589 3,552 3,135 3,614	—	social support  supervisor support  co-worker support	emotl exhaustion depersonalisation personal accompt emotl exhaustion depersonalisation personal accompt emotl exhaustion depersonalisation personal accompt	r=-.32 not significant not significant r=-.37 r=-.34 not significant r=.22 r=-.22 not significant
500	meta-analysis	—	—	—	—	—	—	supervisor support	health outcomes	r = .24



## References:

- 404 Stansfeld S A, North F M, White I, Marmot M G (1995), 'Work Characteristics and Psychiatric Disorder in Civil Servants in London', *Journal of Epidemiology and Community Health*, Vol. 49, pp. 48-53
- 407 Stansfeld S A, Bosma H, Hemingway H, Marmot M G (1998), 'Psychosocial Work Characteristics and Social Support as Predictors of SF-36 Health Functioning: The Whitehall II Study', *Psychosomatic Medicine*, Vol. 60, pp. 247-255
- 408 Stansfeld S A, Fuhrer R, Shipley M J, Marmot M G (1999), 'Work Characteristics Predict Psychiatric Disorder: Prospective Results From The Whitehall II Study', *Occupational and Environmental Medicine*, Vol. 56, pp. 302-307
- 320 Borg V, Kristensen T S, Burr H (2000), 'Work Environment and Changes in Self-Reported Health: A Five Year Follow-Up Study', *Stress Medicine*, Vol. 16, pp. 37-47
- 236 Stansfeld S A, Fuhrer R, Head J, Ferrie J, Shipley M (1997), 'Work and Psychiatric Disorder in the Whitehall II Study', *Journal of Psychosomatic Research*, Vol. 43, No. 1, pp. 73-81
- 247 Bromet E J, Dew M A, Parkinson D K, Schulberg H C (1988), 'Predictive Effects of Occupational and Marital Stress on the Mental Health of a Male Workforce', *Journal of Organizational Behavior*, Vol. 9, pp. 1-13
- 303 Marmot M G, Bosma H, Hemingway H, Brunner E, Stansfeld S (1997), 'Contribution of Job Control and Other Risk Factors to Social Variations in Coronary Heart Disease Incidence', *The Lancet*, Vol. 350, pp. 235-239
- 233 Lee R T, Ashforth B E (1996), 'A Meta-Analytic Examination of the Correlates of the Three Dimensions of Job Burnout', *Journal of Applied Psychology*, Vol. 81, No. 2, pp. 123-133
- 500 Cass M, Faragher B, Cooper C L (2002), *Health and Employment: a review and meta-analysis*, Health and Safety Executive

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

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Source: IES 2002

### **4.9.7 Effect sizes**

The effect sizes that were reported were small to moderate. Mean correlation coefficients in meta-analyses ranged between .12 and .37, whilst the odds ratios and rate ratios of individual papers were between 1.06 and 1.63.

### **4.9.8 Summary**

These papers provide clear evidence that workplace support can be an important predictor of psychological health. Low support or deterioration in support has consistently been found to lead to an increase in psychiatric symptoms, increased absence, decreased satisfaction and increased work stress.

However, there is some indication that different forms of support (practical and emotional) and from different sources (supervisor, co-worker and non-work) are important in different aspects of work and health outcomes.

## **4.10 Support: Bullying and harassment**

### **What is the evidence for the impact of exposure to the stressors grouped under bullying and harassment?**

In the HSE framework, the stressor bullying/harassment is conceptualised as: poorly designed or managed procedures for eliminating damaging conflict at the individual/team level (bullying/harassment).

The review found very little evidence in the literature concerning the lack of appropriate systems or procedures for eliminating conflict. The evidence that does exist appears to focus on the impact of bullying, harassment, negative relationships or conflict, experiences that largely happen where there are poorly designed or non-existent procedures for its management. Therefore, we have included this type of evidence in the review.

#### **4.10.1 Number of papers and samples**

In total, four papers were reviewed that offered evidence about the impact of bullying/harassment/conflict. Details of these papers are summarised in Tables 4.19 (work-related outcomes) and 4.20 (health-related outcomes). Two of these were based on UK samples, one on a US sample and one on another northern European sample. Three of these samples were drawn from a general population, whilst the fourth was a large sample of civil servants.

#### **4.10.2 Study design**

All studies reviewed were cohort studies with follow-up periods ranging from six months to four years. Sample sizes ranged from 362 in the smallest study to over 10,000 in the largest.

#### **4.10.3 Measures of bullying/harassment**

Subjective measures included self-reports of bullying, racial abuse, sexual harassment, abusive supervision, social conflict and animosities and negative relationships.

No objective measures were taken.

#### **4.10.4 Outcome measures used**

All outcome measures in the reviewed papers were subjective in nature for both work-related and health-related outcomes.

Subjective measures of work-related outcomes included: work stress; turnover; job satisfaction; life satisfaction; continuance commitment; normative commitment; affective commitment; work to family conflict; and family to work conflict.

Subjective measures of health outcomes included: depression, health complaints; irritation; worrying; physical functioning; mental health; social functioning; anxiety; and emotional exhaustion.

#### **4.10.5 Findings and consistency of evidence: impact of bullying/harassment on work- related outcomes**

Two papers reported on work-related outcomes in relation to bullying and harassment (see Table 4.19).

#### **Meta-analyses**

No meta-analyses were found to contribute evidence.

#### **Individual papers**

A UK general population study of 1,800 (364) found that people who reported they had experienced being bullied were significantly more likely to report higher levels of work stress 12 months on. However, experience of racial abuse or sexual harassment was not found to be significant in predicting work stress.

A US general population survey (385) identified 362 people who reported that they had recently left their job. The study found that

those who reported experiencing abusive styles of supervision were significantly more likely to leave, and over a six month time period were more likely to report experiencing lower job and life satisfaction, lower commitment and higher levels of conflict between family and work.

**Table 4.19: Evidence for the impact of bullying/harassment/conflict on work-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
364	cohort	12m	General population	UK	—	1.8k	N	bullying <sup>1</sup> racial abuse <sup>1</sup> sexual harassment <sup>1</sup>	work stress <sup>1</sup>	significant <sup>3</sup> not significant not significant
385	cohort	6m	General population	US	—	362	N	abusive supervision <sup>1</sup>	turnover <sup>1</sup> job satisfaction <sup>1</sup> life satisfaction <sup>1</sup> continuance commitment <sup>1</sup> normative commitment <sup>1</sup> affective commitment <sup>1</sup> work to family conflict <sup>1</sup> family to work conflict <sup>1</sup>	significant <sup>3</sup> r <sup>2</sup> =.13 r <sup>2</sup> =.04 r <sup>2</sup> =.02 r <sup>2</sup> =.07 r <sup>2</sup> =.06 r <sup>2</sup> =.05 r <sup>2</sup> =.01

References:

364 Smith A, Johal S, Wadsworth E, Davey Smith G, Peters T (2000), *The Scale of Occupational Stress: The Bristol Stress and Health at Work Study*, Health & Safety Executive, Contract Research Report 265, HSE Books

385 Tepper B J (2000), 'Consequences of Abusive Supervision', *Academy of Management Journal*, Vol. 43, No. 2, pp. 178-190

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

Source: IES 2002

#### **4.10.6 Findings and consistency of evidence: impact of bullying/harassment on health outcomes**

Three papers reported on the health-related outcomes associated with conflict, negative relationships and abusive supervision (see Table 4.20).

##### **Meta-analyses**

No meta-analyses were found to contribute evidence.

##### **Individual papers**

A general population study set in Germany (270) tested several models of the relationships between stressors and strain over time. They found that social stressors (conflict and animosities) showed a number of significant relationships with strain. In particular, with increased reports of depression, psychosomatic complaints, irritation and worrying.

A study of UK civil servants (407) explored the impact of negative interactions with the person nominated as closest to the individual. For those reporting highly negative interactions, there was significant relationship to poorer levels of physical functioning, mental health and social functioning in both men and women.

A general population survey in the US (385) found that experience of abusive supervision styles had small but significant relationships with depression, anxiety and emotional exhaustion six months on.

**Table 4.20: Evidence for the impact of bullying/harassment on health-related outcomes**

Paper	Design	Timescale	Sample	Country	Control	N	Baseline	Stressors	Outcomes	Effect size
270	cohort	24m	General popn.	German	—	400+	N	social conflict and animosities <sup>1</sup>	depression <sup>1</sup> health complaints <sup>1</sup> irritation <sup>1</sup> worrying <sup>1</sup>	r=.18 r=.34 r=.25 r=.16
407	cohort	4yrs	Civil servants	UK	—	10k+	Y	negative relationships <sup>1</sup>	physical functioning <sup>1</sup> mental health <sup>1</sup> social functioning <sup>1</sup>	OR=1.29 in men, OR=1.62 in women OR=1.21 in men, OR=1.63 in women OR=1.88 in men, OR=1.48 in women
385	cohort	6m	General popn	US	—	362	N	abusive supervision <sup>1</sup>	depression <sup>1</sup> anxiety <sup>1</sup> emotional exhaustion <sup>1</sup>	r2=.03 r2=.04 r2=.13

References:

- 270 Garst H, Frese M, Molenaar P C M (2000), 'The Temporal Factor of Change in Stressor-Strain Relationships: A Growth Curve Model on a Longitudinal Study in East Germany', *Journal of Applied Psychology*, Vol. 85, No. 3, pp. 417-438
- 407 Stansfeld S A, Bosma H, Hemingway H, Marmot M G (1998), 'Psychosocial Work Characteristics and Social Support as Predictors of SF-36 Health Functioning: The Whitehall II Study', *Psychosomatic Medicine*, Vol. 60, pp. 247-255
- 385 Tepper B J (2000), 'Consequences of Abusive Supervision', *Academy of Management Journal*, Vol. 43, No. 2, pp. 178-190

<sup>1</sup> subjective measure

<sup>2</sup> objective measure

<sup>3</sup> effect size not reported

#### 4.10.7 Effect sizes

The reported effect sizes were generally small to moderate. Correlation coefficients ranged from .16 to .34,  $R^2$  statistics were between .01 and .13, and odds ratios ranged from 1.21 to 1.88.

#### 4.10.8 Summary

The results of research into self-reported experience of bullying and harassment are clear and consistent, although based on relatively few studies.

Animosity, social conflict, negative relationships and abusive supervisory styles and bullying are consistently associated with some negative work-related and health-related outcomes, regardless of sample and follow-up period. Only racial abuse and sexual harassment were not found to be causally related to subsequent reports of work stress.

### 4.11 Summary

This chapter reviewed the best available evidence concerning the impact of exposure to each of the nine stressors. The quantity and consistency of evidence for each stressor varied enormously. The main findings for each stressor are summarised below.

- Workload: a mixed pattern of relationships was found – some evidence that increases in workload had a negative impact, some evidence of low work pace having a similarly negative effect, and a number of studies finding evidence for no relationship.
- Work scheduling: although based on a small number of studies, consistent evidence was found for the negative impact of shift working and the positive impact of flexible work schedules.
- Work design: based on the limited evidence, there were improvements to the work-related outcomes, but not to mental health, following work design improvements.
- Physical environment: the majority of studies found evidence of no relationship between physical environment stressors and both work-related and health-related outcomes.
- Other forms of demand: general job demands were found to have a negative impact on outcomes, as were job-specific demands in particular occupations (*eg* nurses).
- Skill discretion: low skill discretion had a negative impact on a range of work-related outcomes, but the evidence suggests a less consistent impact on health-related outcomes
- Decision authority: autonomy showed a positive impact on health-related outcomes, but there was mixed evidence for its



impact on work-related outcomes with a number of studies finding evidence of no relationship. Decision latitude had a more consistent positive impact on both work-related and health-related outcomes.

- Other forms of control: low job control had a negative impact on work-related outcomes, but there was mixed evidence in relation to health outcomes – some studies found evidence of a negative impact, but others found evidence of no impact.
- Support: low support was found to have a negative impact on both work-related and health-related outcomes.
- Bullying/harassment: social conflicts and negative relationships at work had negative effects for both work-related and health-related outcomes.

# 5. Review Question 3: Evidence on the Nature of The Relationship Between Stressors and Effects

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## 5.1 Introduction

The main aim of review question 3 was to examine evidence about the nature of the relationships between stressors and outcomes, including:

- the shape of the association (linear or non-linear)
- the mechanisms that underpin the relationship (including the possibility that some job stressors mediate others), and
- the individual's job or situational factors that moderate the strength of the relationship.

## 5.2 Scale of the literature

All of the research papers identified as providing evidence on the nature of the link between stressors and their effects, also contributed evidence to review question 2. Therefore, the evidence described in this section is in part an extension of that described in the previous chapter.

**Table 5.1: Stressors for which evidence was identified**

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<b>Stressor</b>	<b>Paper reference number</b>
Workload	306, 102, 73, 392, 404, 406, 281, 270, 178, 305
Work scheduling	271, 351, 465
Work organisation	157
Physical environment	381
Other demands	149, 227, 381, 267, 199, 103, 247, 320, 310
Skill discretion	42
Decision authority	404, 407, 178, 82, 247, 244, 103
Other control	305, 306, 406, 38, 392, 42, 73, 102
Support	392, 406, 247
Bullying/harassment	385, 270

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Source: IES 2002

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The review identified 29 papers which provided evidence on the nature of the relationship between the nine stressors and their effects. The rest of this section looks at each of the stressors and identifies the evidence available.

## 5.3 Demands

### 5.3.1 Workload

In total, ten papers contributed some evidence to the nature of the link between workload and its effects. Of these, eight papers showed some form of interaction (*ie* variation in the effect of workload when it was combined with other factors), one showed an indirect effect of workload, one showed a non-linear relationship between workload and its effects, and one showed how workload had both long-term and short-term effects.

#### Interactions and combinations

Workload variables were found to interact with a various other factors to affect outcomes. The majority of these other factors were different types of stressors, particularly aspects of job control.

Four papers showed how the effect of workload varied with different levels of job control. In its study of a sample of nurses, papers 305 and 306 found significant interactions between workload and control in predicting job satisfaction, systolic blood pressure both at work and at home, diastolic blood pressure when at home, cortisol levels when at work and at home, and health care costs. The majority of these interactions were in the direction expected: higher levels of workload are associated with increases in negative outcomes under lower control conditions. However, for one interaction, nurses' high personal control exacerbated the effects of workload. More specifically, greater numbers of patient deaths adversely affect the job satisfaction of nurses only when they had high levels of perceived control.

Paper 404 showed the same interaction pattern between psychological demands (a combination of work pace and conflicting demands) and decision latitude (a combination of control and variety and skill use). In this study, 41 per cent of women and 37 per cent of men with high demands and low control were possible cases of psychiatric disorder.

Although changes in demand alone were not significantly related to either strain or job satisfaction in paper 73, the interaction between demand and control was a significant predictor of job satisfaction: only under the condition of little or no increase in demand were the positive effects of enhanced control seen.

One paper examined how workload, control and support combined to affect job satisfaction, depersonalisation and performance. Paper 392 found that, although work overload had no direct impact on the outcomes various, the three-way interactions between overload, control and support were significant. There was consistent evidence that, at high levels of support and control, workload had a positive impact on job satisfaction and performance, and mitigated against depersonalisation.

One paper found that the relationship between workload and negative outcomes varied with individuals' need for social approval. Paper 281 found that whilst high workload did not have an impact on its own, when it was combined with individuals monitoring the appropriateness of their own behaviour it did predict psychological and physical distress. So those concerned with social approval experienced greater distress under conditions of greater work demands

Two further papers showed how the effects of workload varied with the level of other factors. Paper 102 found that the impact of stressors varied over time. The relationship between time pressure, and emotional exhaustion and negative mood were found during the month-end, when workload was highest. But during normal working periods, mood and exhaustion were

mainly be predicted by other factors beyond time pressures. The effects of workload were also found to vary with factors such as gender, age and employment grade in paper 406.

### **Indirect relationships**

One paper showed how the effects of workload on well-being were indirect. Paper 102 found that sustained high workload was related to a reduction in perceived control and an increase in time pressures, and these two work characteristics were directly related to emotional exhaustion and negative mood.

### **Non-linear relationships**

One paper examined non-linear relationships between workload stressors and their effects. Paper 102 found that, in addition to a linear positive relationship between time pressure and exhaustion, this stressor and outcome were also related in a curvilinear way: very low and very high levels of time pressure produced higher levels of exhaustion.

### **Other relationships**

Paper 270 examined how the relationship between time pressure and strain unfolded over time. Overall, it reported two effects side-by-side: an overall long-term effect of time pressure on slowly changing components of strain; and a short-term and synchronous reaction of time pressure and strain.

Paper 178 showed how the combinations of stressors can cancel out their respective effects. The main focus of the paper is on the effect of temporary contracts on job strain via perceived stressors (participative decision-making and role overload). The study showed how both participative decision-making and role overload were related to job strain. For temporary workers this means both advantages and disadvantages, because although they had less participative decision-making, they also had less role overload.

## **5.3.2 Work scheduling**

Three papers contributed some evidence to the nature of the link between work scheduling and its effects. Two of these papers were meta-analyses and one was a within-subject study. All three papers demonstrated variations in the effects of different work schedules and the complexity of the relationship they examined.

### **Interactions and combinations**

The effects of work schedule variables were found to vary due to the influence of other factors.

A meta-analysis of the impact of flexitime and compressed workweeks (paper 271) showed how their positive effects varied by employee type and degree of flexibility. Whilst employees were appreciably affected by the introduction of flexitime, managers/professionals were not. Contrary to expectations, less flexible schedules resulted in larger effect sizes for all positive outcomes.

A second meta-analysis (342) compared the sleep length of shift workers and those of permanent day-shift workers, and found a varied effect for different types of shift work. Permanent evening shift workers had greater sleep length than day-shift workers, whilst permanent night and rotating shifts workers had less sleep than both. A similar pattern emerged with different types of rotation, more sleep for those with evening shifts occurring in the rotation, but less sleep for those with morning or night shifts occurring. Rapidly-rotating shifts also resulted in less sleep than slower-rotating shifts. Furthermore, within both rapid and slow rotation the same basic pattern of effects for type of shift emerged – night shifts having the most detrimental effect, followed by day shifts, and evenings having a positive effect.

Paper 465 examined the effects of a two week offshore work cycle on alertness and cognitive performance. The complex pattern of results showed how these effects were associated with different phases in the work cycle, with different shifts and with different times during the shifts.

### **5.3.3 Work organisation**

Only one paper contributed some evidence to the nature of the link between work organisation and its effects.

Paper 157 studied the impact of job enlargement and found a complex picture of both costs and benefits, depending on the nature of the job enlargement. Task enlargement was found to cause lower satisfaction, lower error-catching and lower customer service. But knowledge enlargement led to benefits, including increased satisfaction, lower mental load, improved error-catching and customer service. The authors concluded that employees with more knowledge can handle higher workload with greater quality and efficiency.

### **5.3.4 Physical environment**

Only one paper contributed some evidence to the nature of the link between the physical environment and its effects, finding a variation in effect with different levels of another stressor.

Although paper 381 found no direct impact of noise on blood pressure change or job satisfaction, there was a significant interaction with job complexity. Among workers exposed to high



noise levels, systolic blood pressure increased by a greater percentage (six per cent) in those with high complexity jobs compared to those in low complexity jobs (two per cent). Among workers exposed to low noise, there was no change in systolic blood pressure for those with high complexity jobs, but a four per cent increase was observed for those with low complexity jobs. Similar patterns were found for diastolic blood pressure and job satisfaction. The authors conclude that the anticipated positive effect of job complexity is manifested only under favourable environmental conditions.

### **5.3.5 Other forms of demands**

Nine papers contributed some evidence to the nature of the link between other forms of demand and their effects. Of these, six papers showed some form of interaction (*ie* variation in the effect of other demands when combined with other factors), two showed indirect effects of other demands, and one showed a non-linear relationship between other demands and its effects.

#### **Interactions and combinations**

Other demands were found to interact with a various other factors to affect outcomes. The majority of these other factors were different types of stressors.

Three papers showed how the effects of other demands varied with different levels of job control. Paper 310 showed how workers with jobs that have become more demanding and allow less decision latitude will show more mental strain symptoms at the end of the change period than at the beginning. Similar patterns were found by paper 103. When demands increased in relation to decision latitude, there were marked changes in sleep disturbance. In the case of prolactin (a pituitary hormone associated with stress) there was a two-way interaction between increasing demands, low decision latitude and depressive tendency for the total sample. Systolic blood pressure during work hours increased with increasing demands and reduced decision latitude. Paper 247 also demonstrated the interactive effect of job demands and job decision latitude on alcohol problems: at high levels of job demands, workers with less decision latitude were more likely to report alcohol problems, while at lower levels of job demands the effects of decision latitude were less pronounced.

Paper 247 also showed evidence for a buffering role of support with significant job demands in its relationship with affective disorder: high levels of support protected against the negative effects of high job demands.

As described in 5.3.4, paper 381 found that the anticipated positive effect of job complexity is manifested only under favourable

environmental conditions. Systolic and diastolic blood pressure and job satisfaction increased by a much greater percentage in those with high complexity jobs, compared to those in low complexity jobs, but only among workers exposed to high noise levels.

Paper 149 found the effects of job complexity varied with the Type A behaviour personality trait. Although job complexity factors did not predict cardiovascular disorder alone, they did interact with Type A behaviour to affect cardiovascular health. For both task-person complexity and psychological complexity, these stressors were positively related to cardiovascular morbidity among people high on Type A behaviour. There was also a significant negative relationship for those people showing Type B behaviour, for whom psychological complexity was negatively related to morbidity. Type A individuals scoring high on both psychological complexity and task-person complexity were also significantly more at risk of cardiovascular disorder, than all the Type B or A individuals who scored lower on either dimension.

Paper 199 examined sickness absence in employees following the nadir of economic depression and found variations in the relationships between men and women. Whilst control was the most important predictor for men, a combination of downsizing (reduction in personnel), low control, negative life events and weak sense of coherence were important indicators for women.

### **Non-linear relationships**

One paper examined non-linear relationships between other demands stressors and their effects. Paper 320 studied the relationship between psychological demands and self-rated poor health and found a J- or U-shaped relationship: as psychological demands increased slightly there was an improvement in health, but it deteriorated as demands increased further.

### **Indirect relationships**

Two papers found that other demands were involved in indirect relationships. Paper 227 found that self-efficacy mediated the relationship between job complexity and concurrent initiative. Although job complexity had a direct relationship with concurrent personal initiative, it also had an indirect relationship via self-efficacy.

Paper 267 examined the role of core self-evaluations (a broad personality concept embracing self-esteem and generalised self-efficacy), measured in both childhood and early adulthood, in the relationship between job complexity and job satisfaction. It found that job complexity partly mediated the relationship between core self-evaluations and job satisfaction over time. Self-evaluations

had a direct relationship with job complexity, which, in turn, was related to job satisfaction.

## **5.4 Control**

### **5.4.1 Skill discretion**

One paper contributed evidence to the nature of the relationship between skill discretion and its effects, finding that the relationship varied with different levels of a personality trait. Paper 42 found that, although skill utilisation had no direct impact on various work-related and health outcomes, it did interact with a hostility personality trait to predict nurses' health insurance claims.

### **5.4.2 Decision authority**

Seven papers contributed some evidence to the nature of the link between decision authority and its effects. Of these, five papers showed some form of interaction (*ie* variation in the effect of decision authority when it was combined with other factors), and one showed an indirect effect of decision authority.

### **Interactions and combinations**

Decision latitude was found to interact with various other factors to affect outcomes. The majority of these other factors were either workload or other forms of job demand. As such, some of the evidence described below has already been discussed earlier in this chapter, in sections 5.3.1 and 5.3.5, which reviewed evidence concerning these other stressors.

Four papers showed how the effect of decision latitude varied with different levels of workload or job demand. Paper 244 showed how participation was a more important predictor of job strain than change in workload. A change in workload did not independently predict a change in job strain. However, those who changed the way their work was organised, without participation in these changes, did show an increase in reported strain and workload. Those who changed with participation showed no increase. A similar pattern was found in relation to sleep disturbance, the hormone prolactin, and systolic blood pressure (paper 103), alcohol-related problems (paper 247) and poor mental health (paper 404).

The effects of decision latitude were also found to vary with factors such as gender. For example, in paper 407, the effects of low decision latitude were associated with poor mental health in men but not in women.

## **Indirect relationships**

One paper found evidence of an indirect relationship between decision authority and its effects. Paper 82 found that organisational commitment mediated the relationship between a measure of job autonomy and subsequent safe working: job autonomy was related to organisational commitment, which, in turn, predicted safe working.

## **Other relationships**

Paper 178 showed how the combinations of stressors can cancel out their respective effects. The study showed how both participative decision-making and role overload were related to job strain. For temporary workers this meant both advantages and disadvantages, because although they had less participative decision-making they also had less role overload.

### **5.4.3 Other forms of control**

Eight papers contributed some evidence to the nature of the link between other forms of control and their effects. All of them showed some form of interaction (*ie* variation in the effect of job control when it was combined with other factors). Some of these other factors were stressors themselves – including workload or other forms of job demand. As such, some of the evidence described below has already been discussed earlier in this chapter, in sections 5.3.1 and 5.3.5.

## **Interactions and combinations**

Three papers showed how the effect of job control varied with different levels of workload or job demand. When jobs were both low in control and high in demands, they were associated with increases in negative outcomes including: job satisfaction (paper 73 and paper 306); systolic blood pressure, diastolic blood pressure and cortisol levels (paper 306); and individual health care costs (paper 305). One interaction was not in the expected direction however: high personal control in nurses exacerbated the negative effects of patient deaths on job satisfaction.

One paper examined the relationships of control, workload and social support and their combination with job satisfaction, depersonalisation and performance. Paper 392 found consistent evidence that at high levels of support and job control, workload had a positive impact on job satisfaction and performance, and mitigated against depersonalisation.

One paper (102) found that a reduction in perceived control was directly related to emotional exhaustion and negative mood only during the month-end, when workload was high. During normal

working periods, mood and exhaustion were mainly be predicted by other factors.

The three remaining papers found variations in the effects of job control with different levels of individual factors. In paper 42, the effect of control on various work-related and health outcomes was examined. Job control interacted with a hostility personality trait to predict nurses' health insurance claims. Paper 406 showed that the effects of control on absence due to back pain differed by grade and gender in both magnitude and direction. For men, those in top grades with low control were over three times more likely to have short absence due to back pain, and those in low grades with low control were less likely to be absent. The direction of this interaction was different for women for short absences – among the higher grade stratum, low control was protective, and among the lower grades it was a risk factor. The authors say that these interactions may be explained by one or more of the following: 1) work characteristics measuring different constructs at different grades, 2) work characteristics measuring the same construct with differing precision, 3) the meaning and consequences of work characteristics may differ at each grade. Meanwhile, paper 38 showed that the impact of self-reported job control on heart disease was higher for men reporting negative personal characteristics, compared to men without negative personal characteristics.

## **5.5 Support**

### **5.5.1 General support**

Three papers contributed some evidence to the nature of the link between support and its effects. All of them showed some form of interaction with other factors, and two showed interactions with other stressors. Therefore, the evidence described below has already been discussed earlier in this chapter, in sections 5.3.1, 5.3.5, 5.4.2 and 5.4.3.

#### **Interactions and combinations**

Paper 392 examined the relationships between social support, workload and control. There was consistent evidence that at high levels of support and control, workload had a positive impact on job satisfaction and performance and mitigated against depersonalisation. High levels of supervisor support buffered people in low control and high workload jobs, specifically for job satisfaction and depersonalisation. High levels of co-worker and non-work support under conditions of low control and high workload were associated with better levels of performance. High levels of co-worker support buffered individuals with low control, such that they had lower depersonalisation than those with low co-worker support. Overall, the beneficial effects of active jobs

(high control and high workload) were apparent only when accompanied by high levels of supervisor or non-work support.

Similarly, paper 247 provided some evidence for a protective role of support, with significant job demands in its relationship with affective disorder.

Although paper 406 found no direct impact of social support, it did significantly interact with grade to predict short absences due to back pain in men. For high grades, low support protected against absence, but it was a risk factor for low grades.

### **5.5.2 Bullying/harassment**

Two papers contributed some evidence to the nature of the link between bullying and harassment and their effects.

Paper 385 found that the negative effects of abusive supervision were fully mediated by organisational justice. In other words, abusive supervision had its effects on outcomes by affecting perceptions of fairness. In addition, perceived job mobility moderated the effects of abusive supervision on outcomes. In other words, the effects of abusive supervision on outcomes depended on whether people think they can get another job.

Paper 270 examined how the stressor-strain relationship unfolded over time. Overall, they found two effects side by side: an overall long-term effect of social stressors (conflict and animosities) on slowly changing components of strain; and a short-term and synchronous reaction effect of social stressors and strain.

## **5.6 The theoretical context**

This chapter has considered evidence for the nature of the relationships between stressors and effects. For the most part, this has been interpreted in terms of understanding mechanisms through which stressors have their effects. In particular, the following mechanisms were discussed: the interaction or combination of stressors; indirect or mediated effects of stressors; and non-linear relationships.

These three possible mechanisms represent a very small proportion of the total number of theoretical mechanisms, and of propositions that have been suggested to explain how stressors have their effects. While some of these other theories have been tested empirically, papers that report the results of such studies could not be included here for a variety of reasons.

Over many decades, numerous theories of work stress have been proposed (eg Cooper, 1998). Some of these are more descriptive models than theories that incorporate a large number of variables. Other models, such as those already discussed here, incorporate

fewer variables and posit relatively simple relationships between them, such that the impact of one stressor (such as workload) on well-being depends on the relative strength of other job conditions (such as support or control). Such models have received mixed support.

Other theoretical approaches, such as person-environment fit, cybernetic approaches, and effort-reward imbalance (see Cooper, 1998, for a review) tend to draw on theory from outside the stress field. Again, where they have been tested, they receive mixed support.

The general theoretical context is therefore one in which there is no shortage of theoretical propositions for explaining, and models for describing, the nature of the relationship between stressors and outcomes. However, it is not clear which theoretical approach has most empirical support, nor which theoretical approach offers most promise. The issue of theory will be discussed further in the discussion and conclusion sections.

## 5.7 Summary

The evidence described above, highlights a number of patterns concerning the nature of the link between stressors and outcomes. In particular, it demonstrates:

- the combined effects of multiple stressors
- differences between individuals
- indirect links between stressors and their outcomes and
- non-linear relationships.

The review shows overall that the relationships between stressors and outcomes is complex. There are different ways in which it is complex and these are discussed below.

The most frequent conclusion of the evidence reviewed here was that stressors combine to produce negative outcomes. In some cases, a stressor only had a negative impact when it occurred with another stressor. In other cases, the negative effect of a single stressor was made worse by the presence of another stressor. In particular, the evidence consistently demonstrated the combined negative effects of high job demands (workload, job complexity, or general job demands) and low job control (decision latitude or general job control). In addition, high levels of social support were found to protect against these negative effects. These findings reflect the importance of Karasek's job demand-control model (Karasek, 1979) in this area. Other combinations of stressors have been examined to a much lesser degree.

The impact of stressors on outcomes was also found to vary with a number of different individual factors. A number of studies

demonstrated how the effects of workload, job control and social support varied with age, gender and employment grade. Stressors were also found to combine with some certain personality factors to effect various outcomes. More specifically, Type A behaviour, hostility and the need for social approval were found to increase the negative impact of some stressors.

Some stressors were found to have their negative effects through other stressors or behaviours. For example, workload had a negative impact via reduced control and increased time pressure, and decision authority had its negative impact via organisational commitment. This suggests that the link between stressors and outcomes may involve sequences of effects that need to be identified.

Finally, the evidence suggests that some of the relationships between stressors and outcomes are non-linear. An incremental increase in a stressor does not necessarily lead to a similar increase in the outcome. For example, both very low and very high levels of time pressure were found to have negative effects. However, few of the studies included in the review explicitly examined whether the relationships between stressors and outcomes were non-linear in this way.





# **6. Review Question 4: Evidence on Interventions to Reduce Workplace Stressors**

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## **6.1 Introduction**

The main aim of review question 4 was to identify research which presented evidence on organisational interventions that aimed to reduce the levels of the nine stressors, and which examined the subsequent effects on health, well-being and organisational performance.

HSE had already commissioned a major review of the literature on organisational interventions to reduce work stress which was published in 1998 (see Parkes and Sparkes, 1998/HSE CRR 193/1998). The current review was to look at this and any subsequent information in relation to the nine stressors which were the focus of the study.

The current review had slightly narrower parameters than the one conducted by Parkes and Sparkes, therefore only some of the interventions identified by Parkes and Sparkes are relevant here. Papers drawn from the Parkes and Sparkes review are identified as such in the text.

### **6.1.1 Scale of the literature**

The limited number of robust research papers investigating the impact of organisational interventions is already well recognised. In their review, Parkes and Sparkes identified only 18 studies which were of suitable quality to include as case studies.

The current review, with slightly different aims and a focus on specific stressors, identified only eight papers that provided evidence on the impact of various organisational interventions on the nine stressors of interest (*ie* seven papers in addition to evidence drawn from the Parkes and Sparkes review).

### **6.1.2 Types of organisational intervention**

The papers studied for this review describe a diverse range of interventions that target different aspects of working life.

In their review, Parkes and Sparkes make a distinction between organisational interventions which are socio-technical in nature and those which are psychosocial interventions. They define socio-technical and psychosocial interventions as:

***Socio-technical interventions** (also referred to as techno-structural interventions) are primarily concerned with changes to objective/ structural aspects of the work situation (eg staffing levels, work schedules, company mergers, work patterns, staff meetings) which have implications for the stress, health and job satisfaction amongst the personnel concerned ... this type of intervention focuses on the initial element of the stress process. Such interventions can provide opportunities for precise manipulation of objective conditions and measurement of outcome; thus the effects of the intervention are potentially amenable to systematic scientific evaluation.*

***Psychosocial interventions** refer to approaches to stress reduction intended to change employees' perceptions of their work through strategies such as increasing participation, communication and social support, reducing role ambiguity and conflict and enhancing control over work tasks.*

(From Parkes and Sparkes, 1998)

For this review, we have drawn on relevant case studies from the comprehensive work by Parkes and Sparkes, and attempted to apply the same socio-technical and psychosocial distinctions to the additional papers identified.

The rest of this section looks at each of the stressors and identifies evidence available and the focus of the interventions (socio-technical or psychosocial).

**Table 6.1: Stressors for which evidence was identified**

<b>Stressor</b>	<b>Paper reference no.</b>
Workload	321
Work scheduling	321
Work organisation	248
Physical environment	331, 329
Other demands	329
Skill discretion	166
Decision authority	248, 36, 166, 387, 193
Other control	329
Support	248, 387
Bullying/harassment	0

Source: IES 2002

**Table 6.1 References**

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## 6.2 Demands

### 6.2.1 Workload

Two case studies in the Parkes and Sparkes review (paper 321) were identified as providing evidence on interventions to reduce workload. Both involve socio-technical interventions.

One study of driving examiners used a within-subjects design of three conditions: nine, ten or 11 driving tests per day for a week. In the 11 tests condition, work-related outcomes included lower pass rates and drastically reduced mental efficiency. Health-related outcomes for the 11 tests condition included higher levels of tension and higher adrenaline levels. These effects may have been mediated by the increased social support and relaxation opportunities in the nine and ten test conditions, rather than just workload differences.

A second set of studies was based in test centres, randomly assigned to one period of nine tests and one period of either eight or seven tests per day, each period lasting 12 weeks. Reduced workload resulted in a number of work-related outcomes, including reductions in perceived demand and an increase in job satisfaction. The pattern of performance over the day was found to depend significantly on workload level. Health-related outcomes included reductions in anxiety.

### **6.2.2 Work scheduling**

Four further case studies in the Parkes and Sparkes (paper 321) review provided evidence on interventions to improve work scheduling. All four involve socio-technical interventions.

One paper examined the effect of a compressed work week of four days. The design included two experimental groups which changed to the four-day compressed work week, and one control group that worked a regular five-day week. Although no significant effects were found for one of the experimental groups, the other showed significant improvements in satisfaction with autonomy, personal worth, job security and pay, a reduction in anxiety, and improved productivity and team effectiveness. It is suggested that the differences between the two experimental groups may be due to unmeasured, pre-existing differences.

A second study examined the impact of flexitime schedules in four work units that were randomly assigned to either the experimental flexitime condition or the control condition of fixed hours. A significant difference between the two conditions was found for performance, and short-term unpaid absence – flexible hours providing employees with an alternative to short-term leave. However, this difference was due to an increase in short-term absence in the control group as well as a decrease in the experimental group. It is possible that the increase in absence may have been due to the control group resenting the flexitime of the experimental group.

The third study reviewed, also examined the impact of work schedule flexibility. The design involved one unit of an organisation being randomly chosen as the experimental group and one as a control. The introduction of work schedule flexibility to the experimental group led to significant changes in perceptions of flexibility, in workgroup relations and supervisor-subordinate relations, and in absenteeism.

The final study examined the introduction of two work schedule changes – compressed four-day work weeks and flexitime. The compressed work weeks showed a general trend towards improved organisational effectiveness, decreased interference with personal activities, and greater satisfaction with work schedules. These effects reversed when the regular five-day

schedule was reintroduced. Flexitime led to significant improvements in employees' affective responses to the work schedule, and measures of family and social life. There were not strong improvements, but it is suggested that this may be due to the small sample sizes.

### **6.2.3 Work organisation**

One of the papers included in the review provided evidence on a socio-technical intervention to improve work organisation.

This study (paper 248) examined over a 28-month period, a job redesign implemented in a department of a sweet manufacturing company. The job redesign was implemented as a result of recommendations arrived at through observations, interviews, and a survey of staff. Changes were aimed at substantially increasing group task identity, group autonomy, and group feedback. Analysis showed that the changes introduced produced the intended effect and that increases were maintained over the 28-month period. The effect of group feedback, however, failed to reach statistical significance, suggesting that this element was either unsuccessfully implemented, or that the intervention had no effect on this variable. The observed changes in work characteristics were accompanied by equivalent increases in internal work motivation, general job satisfaction, performance, mental health and labour retention.

### **6.2.4 Physical environment**

Two papers included in the review provided evidence of interventions to improve the physical environment. One of these was a socio-technical intervention and the other a psychosocial intervention.

Paper 331 examined three groups of office workers who were based in different open-plan office environments. The control group stayed in an open-plan office, whilst one experimental group moved to a location with reduced spatial density, and the other experimental group moved to a location that introduced partitions to increase privacy. Moving to an open plan office with reduced density increased work satisfaction, but had no effect on self-reported performance. Moving to an open plan office with partitions had no effect on either work satisfaction or performance.

A second study (paper 329) took place in four sites of a Dutch organisation over a three year period. In addition to a variety of individual-level interventions, organisational interventions included committees to develop proposals for reorganising certain functions at work. Significant differences were found for working conditions, with a reduction in perceived demand, a large increase in control, and improved ergonomic conditions for the

intervention group. Although the intervention had no effects on lifestyle conditions and general stress reaction, there was an initial significant difference in cardiovascular health risk. However, this difference disappeared at a later follow-up.

### **6.2.5 Other demands**

One of the studies described above also provided relevant evidence for interventions designed to improve other forms of demand. This is paper 329 (see section 6.2.4, physical environment).

## **6.3 Control**

### **6.3.1 Skill discretion**

One study provided evidence of a psychosocial intervention designed to improve skill discretion.

This study (paper 166) took place in four departments in a public health agency. These departments were matched into pairs with similar responsibilities and one department of each pair was randomly assigned to intervention status while the other became a waiting list control group. The two intervention departments each formed problem-solving committees which identified and prioritised aspects of work organisation and job design causing stress among their fellow employees. The committees developed proposals and action plans to reduce stressors, provided feedback to other employees in the departments, and encouraged and assisted management in implementing changes.

The pattern of results suggested that the intervention had a negligible and mixed impact. In one intervention department, it resulted in a slight reduction in skill utilisation and decision latitude, and an increase in job demands and job dissatisfaction. For the other intervention department, there was a slight decrease in job satisfaction. In both departments, a majority of non-committee members felt that the intervention was only slightly effective or not effective, but a few also thought that the intervention should be initiated in other departments. Telephone interviews five months after the post-test revealed that a divisional reorganisation begun one week before the post-test had heavily impacted on the four study departments. It was also suggested that one of the control departments had a director who was very interested in the stressor reduction process and had reportedly implemented similar reforms based on what the intervention department was doing (*ie* there was a diffusion of treatment from experimental to control conditions).

### 6.3.2 Decision authority

Five studies provided evidence of interventions designed to expand decision authority. Four of these were psychosocial interventions and one was a socio-technical intervention.

One study examined an intervention in two different health care institutions over a 12 month period (paper 387). The intervention was a participative action research (PAR) activity based around group discussions and a survey. The aim of the intervention was to set in motion a learning process on how to identify and solve work problems in order to improve workplace health and organisational problems. From the other institutions in the same district, individuals were randomly allocated to either a control group or one of three individual-level interventions (physical training, stress management training, ergonomics). There was a significant positive effect of the intervention on increasing decision authority, social support, and role harmony, relative to decreases in these measures in the control group. In turn, there was a significant overall positive effect of the intervention on work-related stress, which decreased in the intervention group but increased in the control group. There were no significant effects of the intervention on subjective health and anxiety.

Another PAR intervention was examined in a central government department over a period of 12 months (paper 36). A matched randomisation procedure was used to assign six units of the department to the intervention or control group. PAR steering committees were formed by representatives of the three intervention units and two change agents, and met five times over a three-month period. The committee members developed and implemented work organisation changes that might increase people's job control and improve stress-related variables. They focused on assignment distribution procedures, within-unit consultation, and informal performance feedback.

Mental ill-health scores significantly decreased in the PAR group and by the end of the study were significantly lower than they were in the control group. The PAR group also had a small but significant decrease in sickness absence, and significantly less absence than the control group. Self-ratings of performance significantly increased for the PAR group and were significantly higher than the control. No significant effects were found for physical ill health or job satisfaction. Job control increased significantly in the PAR group, was significantly higher than the control group, and fully mediated the improvement seen in the PAR intervention group.

A third study (paper 193) took place over a nine-month period in a US hospital department. The intervention was to increase participation in decision-making through scheduled staff meetings at least twice per month. Pre-analysis checks showed



that intervention and control groups were equivalent, there were no differences between pre-tested and non-pre-tested groups, and manipulation checks were conducted and units re-assigned to different experimental groups as appropriate. The intervention had a direct effect on perceived influence, which in turn had direct relationships with both job satisfaction and intention to leave, but no direct or indirect relationship with emotional stress.

Two further studies that have been described above also provided relevant evidence for interventions designed to improve decision authority. These are papers 248 (see section 6.2.3, work organisation) and 166 (see section 6.3.1, skill discretion).

### **6.3.3 Other forms of control**

One of the studies described above also provided relevant evidence for interventions designed to improve other forms of control. This is paper 329 (see section 6.2.4, physical environment).

## **6.4 Support**

Two studies provided evidence of interventions designed to improve support. One of these involved a psychosocial interventions and one was a socio-technical intervention. These studies have been described above, and relate to papers 248 (see section 6.2.3, work organisation), and 387 (see section 6.3.2, decision authority).

## **6.5 Summary**

Despite the small number of studies, the intervention studies that were reviewed, generally showed positive results.

The socio-technical interventions were particularly successful. The two interventions designed to reduce workload showed improved mental efficiency, satisfaction and better mental health at lower levels of workload. The four socio-technical interventions designed to improve work schedules showed consistently positive results. Compressed work weeks led to improved satisfaction, productivity and effectiveness, and reduced anxiety. Flexitime schedules also led to improved performance and satisfaction with schedules, better relations at work, improved family and social life, and reduced absence. Changes to work organisation (*ie* task identity) were accompanied by increased motivation, job satisfaction, performance, mental health and labour retention. The socio-technical intervention designed to improve decision authority led to increased autonomy and various positive outcomes.

The impact of psychosocial interventions was slightly less consistent, although still encouraging. The four psychosocial

activities designed to improve decision authority did lead to some increased participation and autonomy, and were accompanied by improvements in performance, job satisfaction and mental health, and reductions in absence and intention to leave. However, some of the interventions had marginal effects and did not produce changes in subjective health, anxiety and other outcomes.

The least positive effects were found with interventions designed to improve physical environment, skill discretion, or general levels of demand and control. These had negligible effects, although this partly reflects the small number of studies that contributed evidence.

The general pattern appears to be that more targeted and focused interventions, aimed at changing a specific aspect of work, are more successful than psychosocial interventions which may encompass multiple changes, and interventions focused on a general work characteristic (such as demands or control).



# 7. Discussion

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This review addressed the following four questions:

- Question 1: What proportions of the population are exposed to harmful levels of each of the nine stressors?
- Question 2: What are the effects of the nine stressors on health, well-being and organisational performance?
- Question 3: What are the mechanisms through which stressors have effects on health, well-being and organisational performance?
- Question 4: What organisational activities reduce the levels of each of the nine stressors, and what are the subsequent effects of this on health, well-being and organisational performance?

These questions were addressed by reviewing the best available evidence. Here, the meaning and nature of this evidence is discussed in relation to each of the four questions. In each case, the quantity of evidence, the quality of evidence, and its meaning will be discussed. This is followed by a more general discussion of the nature of the best available evidence.

## 7.1 Question 1: What proportions of the population are exposed to harmful levels of each of the nine stressors?

### 7.1.1 Quantity of evidence

While the importance of this question is clear, there is very little evidence on which to draw. This is for a number of reasons:

- Unclear thresholds: there is no clear definition or systematic means of assessing when harm occurs. While many stressors have negative effects, it is difficult to identify precisely when these effects can be considered harmful or otherwise. For some kinds of clinical conditions and diagnosable psychiatric disorders this may be possible. Most studies do not examine these possible outcomes and it is probably undesirable to focus only on these relatively extreme states as indicators of harm.

- Individual differences: it is widely recognised that there are strong individual differences that determine responses to stressors. This means it is difficult in principle to identify levels of stressors that are generally harmful for a group or population.
- Interests of researchers: in general, researchers have been more interested in examining particular relationships between stressors and outcomes within particular populations and contexts, rather than conducting large-scale studies representative of whole populations.
- The importance of context: even if such studies were conducted, it is likely that context would play a very important role, such that a level of, say, workload which was harmful in one employment context would not be in another.

For these, and other reasons, review Question 1 was revised to: **‘What proportions of the population report that each of the nine stressors is in some way a problem for them?’**

While this revised question differs significantly from the original question, it provides a means of reviewing the best available evidence which may be relevant to the original question. Nonetheless, only one UK study was identified as contributing evidence to the revised question using the criteria developed (see section 2.2.1). This was supplemented by a small number of studies from other countries. There were two main reasons why other studies were excluded from the review of evidence for research Question 1:

- they were not based on a representative sample of the general population
- they did not measure the specific nine stressors.

Of those that were based on representative samples of the general population (*ie* could be included on the first criterion), nearly all measured the incidence of general levels of work stress, not the levels of the nine specific stressors which are the focus of this report (*ie* failed to meet the second criterion). Whilst this report identifies other potential sources of information that could be analysed to provide further evidence (see section 3.3), this additional analysis is outside the scope of the current project.

### **7.1.2 Quality of evidence**

The evidence was based on substantial samples, varying between 1,500 and 4,000. These samples were found to be representative of the general populations from which they were drawn. However, the quality of evidence was limited by its inability to identify the extent to which any of the nine stressors was actually a problem for respondents. Most of the available evidence was drawn from studies that were not designed to address this question. While such studies do identify the proportions of respondents who, for

example, say they work long hours or have little control over their work pace, we do not know whether they also view this as a problem, though the fact that these sorts of measures do relate to both physical and mental health measures, suggests that they are likely to be seen as problems by many people.

### **7.1.3 What does it mean?**

From the limited available evidence, it appears that varying proportions of the population are exposed to varying levels of stressors. High work intensity, high work pace, and low variety were the most prevalent stressors, followed by a lack of decision authority over specific aspects of work, and problematic work schedules. Whilst it is possible to conclude that large numbers of respondents report experiencing high workload or little control over the way that they do their work, and subsequent research indicates that these characteristics can, at least in some circumstances, be damaging, and therefore worth caring about, there are still gaps in our knowledge in this area. What we do not know, is the extent to which these levels of stressors are harmful or viewed as problematic. In general, the available evidence cannot provide an answer to this question: We do not know what proportions of the population are exposed to harmful levels of each of the nine stressors.

## **7.2 Question 2: What are the effects of the nine stressors on health, well-being and organisational performance?**

### **7.2.1 Quantity of evidence**

The number of studies available across each of the stressor areas ranged from four to 24. It is not clear exactly how many studies would constitute a large or adequate body of evidence. However, taking the example of stressors grouped under lack of support, a total of 17 papers were reviewed. Of these 17, three were meta-analyses rather than primary studies. Of the remaining 14 studies, seven were based on data taken from the same (Whitehall) study of civil servants. Irrespective of the results of these studies, one would certainly urge some caution in generalised interpretations of this evidence, because of its limited size and scope.

### **7.2.2 Quality of evidence**

Given the inclusion criteria used to identify papers, the papers were of the highest available quality. However, there were a number of notable possible weaknesses. First, in most studies, measures of both stressors and outcomes were subjective rather than objective. Given the problems relating subjective measures to objective measures of work conditions or objective measures of

health, this makes the interpretation of the results more difficult. For example, the relationship between subjective and objective measures is often not particularly strong. Second, although all the studies examined were longitudinal, a number of them did not control for baseline levels of stressors and outcomes. In other words, studies may have measured changes in, say workload, but only measured a health outcome at the second measurement point. While this permits some inference of causality, stronger designs and analyses relate earlier stressors with later outcomes having controlled for earlier outcomes (*ie* lagged effects) and relate changes in stressors to changes in outcomes. Other studies may have measured changes in the outcome, but only baseline levels of the stressor. Likewise, this limits casual inferences.

### **7.2.3 What does it mean?**

For some stressor areas there were clear relationships between stressors and a range of outcomes. Stressors grouped under work scheduling showed clear and consistent effects on outcomes. Likewise, decision latitude had a consistent positive impact on both work-related and health outcomes. Both low support and negative interpersonal relationship stressors had negative effects on outcomes. Higher levels of general demands and some forms of job-specific demands were found to be related to health and work-related outcomes.

Some stressors displayed negative effects on some outcomes, but not on others. Work design improvements and skill discretion were related to subsequent work-related outcomes, but not to health outcomes.

For other stressor groups, the results showed evidence of negative effects but also evidence of no effects. Autonomy showed a positive impact on health-related outcomes and some work-related outcomes, but some studies found evidence of no impact on certain work-related outcomes. Low job control had a negative impact on work-related outcomes and some health-related outcomes, but some studies found evidence of no impact on health-related outcomes. Although both high workload and low work pace showed negative outcomes, other studies found evidence of no impact of high workload.

For some other categories of stressor, such as physical environment, few effects were found.

For each of the nine stressor areas, at least some evidence was found of their adverse effects, and in general, effect sizes were small to moderate. For some stressors (*eg* physical environment) limited effects were found, whilst for others fairly consistent effects were found (*eg* work schedule, decision latitude, support), and for others the effects were mixed. There is therefore no uniform base of evidence about the effects of the nine stressors. It

is not uniform, in the sense that the quality and quantity of evidence varies across the nine stressor areas. It is also not uniform, in that the nature of the findings across the nine stressor areas varies considerably.

Evidence of inconsistent results implies that there are moderators of the relationship. These could be individual, work/organisational or methodological. A lay interpretation might be that mixed/inconsistent results means there probably isn't a link, whereas an alternative interpretation is that there may well be links, but they do not occur for all contexts or all individuals. The implication is that we need to become more sophisticated in our theories and tests to become more precise in identifying for whom, how and when such links might exist.

## **7.3 Question 3: What are the mechanisms through which stressors have effects on health, well-being and organisational performance?**

### **7.3.1 Quantity of evidence**

The number of studies available across each of the stressor areas ranged from one to ten. These were a sub-set of those studies that contributed to Question 2.

### **7.3.2 Quality of evidence**

As these papers were a sub-set of those addressing Question 2, the comments in 7.2.1 are relevant to these studies. In addition, another potential area of weakness is the analysis used to examine the mechanisms through which the stressors affect health.

### **7.3.3 What does it mean?**

The evidence demonstrated a number of different mechanisms through which the stressors affect outcomes.

Stressors appear to combine to affect health, well-being and performance. Some evidence demonstrated how stressors may only have a negative impact when another stressor is present (*eg* high workload is associated with poor well-being only under conditions of low control). Other evidence showed that the negative effects of stressors may be made worse by the presence of other stressors (*eg* the negative effects of high demands and low decision latitude are increased when they are experienced together). This implies that if you want to assess how stressful an environment is you need to assess demands controls and supports together. However, whilst this evidence does largely focus on combinations of demands, control and support stressors, it usually examines how just two stressors combine.



The effects of stressors also vary with individual differences and socio-cultural factors. It is possible that these variations arise from differences in cognitive processing that shape hazard perception. In addition, the link between stressors and outcomes may involve sequences of effects, involving other stressors, behaviours, or affective reactions in a causal chain. Finally, stressors can have non-linear relationships with outcomes.

While a number of mechanisms have been researched and the evidence for them reviewed, there are many more possible mechanisms which have thus far not been empirically examined to a standard to be included in this review. With a few exceptions, our understanding of such mechanisms remains limited.

## **7.4 Question 4: What organisational activities reduce the levels of each of the nine stressors and what are the subsequent effects of this on health, well-being and organisational performance?**

### **7.4.1 Quantity of evidence**

In total, eight papers were found to provide evidence to address this question. The number of studies available across each of the stressor areas ranged none to five. A small number of studies was expected, as previous reviews have failed to find a considerable body of evidence. The quantity of evidence was reduced further because many interventions were not specifically designed to reduce the level of a particular stressor (the focus of this review question). Given the limited size and scope of the evidence, it should be interpreted with some caution.

### **7.4.2 Quality of evidence**

The quality was generally reasonable, given the inclusion criteria used to identify papers. The majority of studies employed control groups of some description, although many were matched or non-equivalent groups, rather than randomly assigned control and experimental groups. All of the studies controlled for baseline measures of the outcome variables of interest. However, possible weaknesses arose from two areas in particular. First, some of the studies reported difficulties in restricting the intervention to just the experimental group. This meant that it was difficult to make comparisons between the intervention group and the control group, and to draw valid conclusions from these comparisons. Second, some of the interventions were not based on prior evidence that particular stressors were a problem that needed to be addressed. This would have clear implications for the effectiveness of the intervention in actually reducing the stressor, and any subsequent effect on well-being, health or organisational performance.

### **7.4.3 What does it mean?**

Despite the small number of studies, the intervention studies that were reviewed, generally showed positive results. The socio-technical interventions, such as changes to workload and work schedule, clearly reduced the presence of stressors and had positive effects on well-being and performance measures. The effect of psychosocial interventions were slightly less consistent. The psychosocial activities designed to improve decision authority were most successful, leading to increased participation and autonomy and accompanied by improvements in well-being and performance. However, some of the interventions had marginal effects or negligible effects. The general pattern appears to be that more targeted and focused interventions, aimed at changing a specific aspect of work, are more successful than psychosocial interventions, which may encompass multiple changes, and interventions focused on a general work characteristic (such as demands or control).

It is possible that the small number of intervention studies is due to a publication bias, *ie* intervention studies which find non-significant or negative results are not published.

What this means is that some kinds of interventions in some contexts do appear to reduce stressors, which in turn reduces the effects of those stressors. At the same time, the quantity of evidence is small.

## **7.5 General discussion**

### **7.5.1 No evidence of relationships versus evidence of no relationship**

An important distinction must be made between the absence of evidence for particular relationships and the presence of evidence which shows that there are no relationships. An absence of evidence was found only for reactive support (as originally defined in the HSE framework), *ie* no studies were identified which provided any evidence relating to the relationship between reactive support and outcomes. Some evidence was identified for all the other stressors, although it was generally a small amount, ranging between four and twenty four studies for each stressor. In particular, only a small number of studies were found that provided evidence relating to work scheduling, work organisation, physical environment, skill discretion and bullying/harassment.

Evidence which showed no relationship between stressor and outcome was found in most studies, as most studies found no relationship between a stressor and at least one of the outcomes they measured. Overall, however, the evidence reviewed here

suggests that for some stressors there are clear, strong, or consistent relationships between stressors and outcomes. For others, there is mixed evidence, with some studies showing strong relationships but others finding evidence of no relationships. And for a few, there is more consistent evidence for no relationships between stressor and outcome.

However, it should also be noted that a likely publication bias in this field, as in other fields, is towards positive (*ie* hypothesis confirming) results. It is therefore possible that, in relation to the sum total of evidence, the published evidence used here inflates both the number and strength of relationships between stressors and outcomes.

### **7.5.2 Effect sizes**

The majority of effect sizes reported in the studies were either small or medium-sized.<sup>1</sup> Taken as a whole, this indicates that the effects of single stressors on health, well-being, and organisational performance are not particularly strong. However, just as statistical significance does not necessarily imply practical significance, small effect sizes do not necessarily imply practical insignificance. Given the large number of factors which are known to affect health, well-being and organisational performance, it is not particularly surprising that the effect sizes are relatively small. The effect size for single stressor needs to be judged in the context of stressors acting in combination, individual and socio-cultural factors serving to weaken and strengthen relationships, and measurement error.

It is also worth noting that given the complexity of human behaviour and psychology, and trying to measure it, we would never expect to find as strong effect sizes as for much harder and straightforward data (*eg* the effects of chemicals). It is important to distinguish between statistical effect sizes and practical significance. A small effect size for a work characteristic that impacts on large numbers of employees represents an important and potentially influential target for intervention.

### **7.5.3 Cause and effect**

For review Questions 2, 3, and 4 only those empirical studies that were longitudinal in design were selected for review. This is because it is only possible to draw causal inferences (*ie* that a stressor caused some outcome) in such designs. However, it should also be noted that the results of longitudinal designs do not necessarily reveal causal relationships. There are numerous design issues with such studies such as the timing of

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<sup>1</sup> Cohen J (1977), *Statistical Power Analysis for the Behavioural Sciences*. New York: Academic Press.

measurements, assumptions about when stressors will have their effects, possible reciprocal relationships, and underlying theoretical assumptions.<sup>1</sup> These mean that we cannot conclude with certainty whether relationships found in such studies are causal ones or are causal in the direction we anticipate. Likewise, as indicated earlier, the absence of relationships in such studies does not mean that causal relationships do not exist. Some of the most powerful designs that enable stronger inference of causality to be drawn are controlled experiments but, for a range of ethical and practical reasons, such studies are not possible in this research field.

#### **7.5.4 Reliability and validity of measures of variables**

While both subjective and objective measures are important and each have their strengths and weaknesses, much of the evidence reviewed here is based on subjective measures. Some of the existing limitations of stressor measures have been reviewed elsewhere (Rick *et al.*, 2001). Some of these same problems also apply to measures of health, well-being and organisational performance. For example, while self-report measures of well-being may reveal that well-being fluctuates over time, the clinical or practical or health significance of such changes is usually not known. Whilst, arguably, the best way to assess mental health is to ask people how they feel (rather than try and infer it from objective measures), there is also an issue that the relevance or importance of such increases to employee harm are difficult to judge. This, and other issues, means that evidence showing the presence or absence of the effects of stressors on general measures of well-being, whilst they tell us about current well-being, can sometimes be difficult to interpret in terms of how they relate to harmful outcomes.

#### **7.5.5 The effects of multiple stressors**

This review considered each of the review questions separately in relation to nine stressor areas. However, what is apparent from both theory and the results of much empirical work is that many of these stressors are likely to interact with each other in sometimes complex ways. For example, the effects of one stressor such as workload may depend on levels of other stressors such as control, lack of support, physical environment, and so on. Some of the results reported here suggest that the combination of stressors is likely to have stronger effects than each of the stressors alone. In other words, while it is possible to consider each review question in terms of each stressor separately, in practice each stressor does

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<sup>1</sup> Zapf D, Dormann C, Frese M (1996), 'Longitudinal studies in organisational stress research: a review of the literature with reference to methodological issues', *Journal of Occupational Health Psychology*, 1, 145-169

not have its effects independently of others. Likewise, interventions to reduce the levels of single stressors are also likely to have their effects, or lack of effects, in relation to the levels of other stressors. In general then, while it is useful up to a point to consider the effects of single stressors and how they may be controlled, work environments do not contain single stressors in isolation, and the effects of any single stressor are likely to depend on the effects of others. This again underlines the importance of assessing demands, controls and support in combination, to understand the extent to which certain work characteristics are likely to cause harm.

### **7.5.6 Theory**

From both practical and scientific perspectives, it is essential to know not only *that* stressors are related to certain outcomes, but also *how* and *why* such relationships exist. In many cases it is not possible to simply remove or reduce a stressor, and more needs to be known about how and why the stressor is having its effects. This allows the development of more effective intervention strategies, and also leads to further theoretical development. This issue is most obviously relevant to review Question 3, but is also highly relevant to all the review questions. The review showed that, while there have been attempts within the field to examine and test theories (eg Karasek and Theorell, 1990), these studies are relatively limited in number. The answers it was possible to provide to each of the review questions, have been limited by the broader limitations of theory within this field.

### **7.5.7 Differences across stressor areas**

One noticeable feature of the research findings is inconsistency of evidence across the nine stressor areas. This inconsistency relates both to the quantity of evidence, but also to the nature of the findings. One interpretation of this is that some stressor areas may be more significant than others for health, well-being and organisational performance, although it is also clear that some stressors have simply not been studied with any level of sophistication. However, another implication is that particular stressors have their effects through other stressors. The impact of, say, lack of support on well-being, may operate through increasing workload levels. This suggests that pinpointing particular stressor areas which seem to have weaker or stronger effects may be misleading, as the causal sequence through which a given stressor has its effects is not known. This issue also relates to the points made above concerning theory and the effects of multiple stressors.

### **7.5.8 The non-cumulative nature of the evidence**

As indicated in the results sections, studies use different types of samples, methods, measures and time frames. Hence, even where results are relatively consistent, it is difficult to combine or add together the findings to produce a cumulative picture of the evidence. However, where consistency is found in results derived from different measures and approaches, this suggests stronger evidence that the relationships exist.

### **7.5.9 Differences in effects across outcomes**

One striking feature of these results is that stressors do not have uniform effects across the range of health and work-related outcomes measured. In other words, where effects of a stressor are found on outcomes, these often concern only some outcomes. Increases in workload may, for example, lead to increases in anxiety, but have no effects on depression, physical symptoms, absence, turnover or job performance. This kind of pattern is also repeated for the interventions discussed here. This suggests that specificity may be an important consideration when thinking about the effects of stressors (see below for further discussion).

### **7.5.10 Differences between the review questions and the research questions addressed by researchers**

Most of the evidence gathered here comes from studies that were not designed or analysed to answer any of the four review questions. Most of these studies set out to test particular hypotheses or models, and in doing so also happened to produce evidence relevant to the review questions. For example, most job redesign studies are not intended primarily as interventions to improve well-being, based on an initial assessment of the causes of poor well-being in that context. Rather, such studies are testing theories of job design. Similarly, most longitudinal studies are not designed to monitor what happens when the level of a stressor increases or decreases, but rather simply monitor changes or otherwise over time. What this often meant, in practice, was extracting information and results from papers that the authors of those papers did not choose to discuss or to focus on. It is worth noting, therefore, that this review is a review of evidence which for the most part was *not* collected in order to answer the kinds of questions posed here. This, in part, explains some of the limitations of the evidence in relation to the four questions.



# 8. Conclusions

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## 8.1 Implications for practice

### 8.1.1 Continuing with the review

Given the absence of systematic reviews of this field and the investment already made in the current review, it may be sensible to make arrangements for this review, or a redesigned version of this review, to be updated on a regular basis, in order that new evidence can quickly be assimilated and acted upon where necessary. An annual or biannual update would probably be appropriate given the rate of new published studies.

### 8.1.2 What to do with limited and mixed evidence

As indicated above, the general trend is that there is some evidence for effects, as well as some evidence for an absence of effects. In some areas, such as work scheduling, the evidence is relatively clear and consistent. However, the evidence is also limited in quantity and generally mixed. Much can be done on the basis of what seems likely or plausible, given existing evidence and theoretical assumptions about the links between stressors and outcomes, as long as the basis on which actions are taken are made clear. In addition, being clear about what is known and what is not known, can form an important basis for taking further action and also for questioning existing practice.

This also indicates a need for the development of more sophisticated theory and research question development.

### 8.1.3 Stressor framework

In broad terms, it appears that the framework and list of stressors developed by HSE neither reflects the current literature nor assumptions about how stressors operate together in complex ways to affect well-being. This is not to say that stressors cannot be found which broadly fit this framework. However, distinctions between the categories in the framework cannot always be sustained, stressors tend to operate together, and that some categories are probably better considered as moderating or



mediating variables rather than stressors in themselves. One implication is that it may be extremely useful to think of other ways of framing or conceptualising the range of stressors people experience at work, how they may have their effects, on what kinds of outcomes, and how they relate and interact with other stressors.

#### **8.1.4 Outcomes framework**

There has been a tendency in work on the effects of stressors, to group all outcomes together and to consider all outcomes as, in a sense, equally important, and all as potentially affected by all or any stressors. The evidence reviewed here shows that this is not the case. Particular stressors seem to affect certain kinds of outcomes. Hence, in addition to modifying or redesigning the stressor framework, it may also be useful at the same time to design some kind of stressor-outcome framework into which evidence linking stressors and outcomes can be placed. This would not only potentially assist with the development of management standards, but also help to focus attention on specific types of links between stressors and outcomes, and between the outcomes themselves.

#### **8.1.5 Improving fit between HSE questions and evidence**

It is clear that there is not a close fit between the questions HSE wishes to address and the questions researchers have chosen to address in their research. There are, however, numerous ways in which this fit can be improved. In addition to commissioning further new research, it has become clear through conducting this review that there are many existing good quality data sets which could be used to address directly these review questions. A further way of improving fit is therefore to conduct analyses on these data that are driven by the questions HSE wishes to answer. Also, if HSE were to more widely publicise its needs for information and evidence among the research community, it may be that researchers in the processes of designing and conducting research could build in design and measurement features which would enable the data collected to be more directly useful to HSE.

#### **8.1.6 Developing standards**

If complete evidence were available, this review would have shown the proportions of people exposed to harmful levels of the nine stressors, which stressors are most harmful and in what ways, how each of the stressors operates, and which interventions are likely to reduce the levels of each of the nine stressors. This would have enabled management standards for good practice in stress to target the most widespread and most harmful stressors,

drawing on sound evidence about the way these stressors work and what can be done to reduce the levels of these stressors.

The available research shows evidence of the proportion of people exposed to stressors, in what ways stressors are harmful, how some of these stressors operate, and how some interventions can reduce the levels and effects of some stressors. However, the evidence is far from complete. It does not show the proportion of people exposed to *harmful* levels of stressors, nor does it enable comparisons of the harmful effects of stressors, an understanding of how *all* the stressors operate together, and the effectiveness of interventions to reduce *all* of them. A key question is, therefore, how this limited evidence can be used or otherwise to develop management standards. First, there is some evidence about which stressors may be most harmful. Second, there is some limited understanding of how stressors operate to cause harm. Third, there are important lessons to be learnt from the results of the interventions discussed here. Finally, given the importance of context, and the relative lack of evidence that applies across all contexts, any standards that are developed also need to encourage a bottom-up approach to understanding how stressors cause problems in each particular organisation or part of an organisation, and what can be done locally to address these issues. A bottom-up approach is particularly relevant in this context, given the broad range of work characteristics which could be important in modern work settings (*eg* emotional demands, performance monitoring, home-work conflict *etc.*).

This accords with other findings and conclusions in this area, in particular, the following conclusions from Parker, Wall and Cordery (2001) in relation to work redesign:

*Anyone contemplating work redesign in a call centre, a high technology plant, among hairdressers, for teleworkers, for knowledge workers, for virtual teams, or in a multitude of other contexts, and armed only with existing work design theory, cannot feel other than inadequately prepared. Those theories, though providing a window, do not speak to the reality and complexity of the situation. Reducing work design theory to a handful of universalistic prescriptions in respect of work characteristics and outcomes might be convenient, but it is not realistic ....*

*... In some contexts, some variables will vary little, so the explanatory power will lie in other variables. For example, social interaction might not vary much in most jobs, but might assume especial significance for certain forms of work such as teleworking. Generally, the choice of variables [in work redesign] will be guided by the overall theory as well as an understanding and analysis of the context.<sup>1</sup>*

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<sup>1</sup> Parker S K, Wall T D, Cordery J (2001), 'Future work design research and practice: Towards an elaborated model of work redesign' [Invited contribution to Future of Work Special Issue], *Journal of Occupational and Organizational Psychology*, 74, 413-440.

The nature of the limited evidence suggests that it is currently not feasible to issue clear and simple directives about which stressors are most harmful, at what threshold they become harmful, how they operate, or what can be done to reduce their levels. This does not mean, of course, that workable suggestions and advice cannot be provided about what is known and not known and what is likely to constitute good management practice around stress.

## **8.2 Implications for research**

### **8.2.1 Research into review Question 1**

Further attempts to examine the proportion of the populations that are exposed to harmful or problematic levels of stressors would be useful given the current lack of evidence. Prior agreement about the definition and measurement of threshold levels would be critical.

### **8.2.2 Research into specific questions asked in the review**

As discussed above (section 8.1.5), one implication is that research needs to be conducted, or existing data to be analysed, in ways which will more directly address the questions HSE wishes to answer. Some suggested means of doing this are discussed above.

It is also worth considering what information could be gathered from some of the more sophisticated cross-sectional studies that were excluded from this review. In particular, in relation to review Question 3, some further information on interactive findings is available which could inform understanding of combined effects and the implications for developing standards.

### **8.2.3 Specificity, processes and non-linearity**

The scientific usefulness and validity of the general notions of 'stress' and 'stressors' has been questioned for some time – not because work conditions do not affect well-being, but rather because of the generally non-specific nature of stress concepts. The results of this review and many other studies show quite specific links between types of work conditions and particular outcomes. For this reason, it may not be useful to label all aversive work conditions as 'stressors', when they may be very different from each other, operate in different ways, and have different effects. One research implication is therefore to attempt to further untangle the theoretical and empirical bases of these specific effects.

A further research implication, which becomes particularly apparent when we consider how different stressors interact or operate together to affect outcomes, is that we lack good theories

of the causal pathways between stressors and outcomes. While it is interesting to know that a particular stressor has some particular outcome, it is also important to know the processes through which that stressor has its effects. We may imagine, for example, a causal chain or pathway or process through which reduced control leads to higher workload, which in turn leads to increased fatigue, which then causes an increase in accidents. It is now time to move away from simple direct models (stressors cause outcomes) or moderated models (stressors cause outcomes depending on a third variable) to more complex approaches which attempt to understand how stressors have their effects or otherwise.

The move towards more specific process-oriented approaches also emphasises the role of non-linear relationships between work conditions and various outcomes. Further research into such relationships promises to reveal more about where and when changes in stressors are likely have their strongest effects.

#### **8.2.4 Theoretical review**

Given the present gaps in evidence, this may be an appropriate time to undertake a critical review of available theories, which may help us to better understand how stressors and other work conditions have their effects on outcomes. The sorts of questions such a review could address include: What theories are available? How do they account for the impact of work conditions? What empirical support exists for these theories? How might they be applied to interventions? This would not only help prioritise research needs but may also help with the development of standards, providing a theoretical tool-kit to shed light on which kinds of practices and behaviours may *in principle* have desired effects and why.

Some important research has come from the HSE's past funding of longitudinal stress research. As one example of this, several of the quality studies that have been described in the current review derive from the HSE funded project 'Organisational Interventions to Reduce the Impact of Poor Work Design' (Parker *et al.*) with future publications to follow. This highlights the importance of funding longitudinal research and the contribution it can make to practice.

#### **8.2.5 Timing of longitudinal studies**

Given the widely varying timescales over which the longitudinal studies reviewed here have taken place, from months to decades, further thinking is required in order to design studies which, for example, capture the chronic and acute effects of stressors, and which are also capable of examining the ways in which people may adapt or adjust to increases in stressors. Underlying such work must be some sound theoretical assumptions about how

stressors have effects on particular outcomes and over what timescales.

### **8.2.6 Measurement of well-being**

As indicated several times in this report, a major limitation of much research in this field is the difficulty of interpreting changes in many of the well-being or health measures used. While we know that changes occur, we do not know what these changes indicate in a tangible or practical way. Without such knowledge, all we can safely conclude is that some stressors may affect levels of well-being according to these measures, not whether such changes matter in any broader sense. Additional research is required to both assess the validity of existing measures of well-being, and also to develop new techniques for assessing well-being in relation to work, that are relevant to the management and control of psychosocial hazards. Whilst it is important to understand people's subjective perception and reactions to their workplaces, it is also important to gather more objective data relating to health and performance, and the relationships between them. This could mean, for example, using improved technology to gather physiological data and to assess it over time. Studies which are wholly dependent on self-report measures are extremely limited in terms of what they can add to this literature.

### **8.2.7 A bottom-up approach to risk management**

Given the apparent limitations of empirical evidence, it is currently not possible to identify those hazards which are likely to be most harmful, and in which contexts. Hence, the top-down approach to risk management where clear and unambiguous advice about hazard, harm and risk can be offered, may not be appropriate at the current time. Future research could start to identify whether more participatory bottom-up approaches to risk identification and risk management are useful in this context.

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## Appendix A: HSE Standards RSU 4297/R54.081

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The following is the annex to the original invitation to tender. It details the output from a scoping exercise undertaken by HSE. The aim of the scoping exercise was to try and describe the elements of jobs that the HSE should take into consideration when developing management standards. The proposed standards are divided into six broad areas (Demands; Control; Support, Training and the Individual; Relationships; Role; and Change). Within each of these broad areas there are a number of more specific potential 'standards' (numbered). For each potential standard there are sub bullets which specify the work characteristics to which the standard refers.

For the purposes of this research, the evidence is being gathered to underpin the development of **nine** standards (out of the total 22 listed). The standards we are concentrating on are spread across **four** of the six broad areas. This work is Phase 1 in HSE terms. The nine standards that form the basis for our research are denoted with an asterisk.

### ITT Annex outline of scope of proposed management standards

\* indicates a standard proposed to be developed in the first phase.

#### Standards grouped under 'Demands'

##### 1. \* Poorly designed/managed workload

- under and over
- quantity (volume)
- pacing and time pressure
- interruptions
- complexity/intensity
- emotional component of the job (eg social work)
- worry about error-making in safety-critical jobs
- worry about consequences of failure to cope with load
- links to boring/repetitive (underload)

## **2. \* Poorly designed/managed work scheduling**

- total hours, breaks
  - travelling time, on-call time
- shift work
- night work, unsocial hours
  - isolation
- uncertain hours
- multiple part-time jobs

## **3. \* Poorly designed/managed work organisation and job design**

- consideration of employee well-being in designing organisational structure
  - especially team working
- consideration of human capability in job design
- task design *eg* allocation of function

## **4. \*Poorly designed/managed physical environment**

- effects on mental well-being
  - danger – real and perceived – including violence
  - exposure to toxic substances
  - noise
  - vibration
  - thermal environment (including humidity)

## **Standards grouped under 'Control'**

### **1. \*Lack of skill discretion**

- task variety
- perceived opportunity to use skill.

### **2. \*Lack of decision authority**

- perceived control over work
- externally imposed pace
- autonomy, need to take initiative

## **Standards grouped under 'Support, Training and the Individual'**

### **1. \*Lack of appropriate proactive support**

- practical and emotional
- work and non-work
- from colleagues
- from managers/supervisors
- lack of recognition/feedback

### **2. \*Lack of appropriate reactive support**

- practical and emotional
- work and non-work
- from colleagues
- from managers/supervisors
  - manager/supervisor ability to cope with others' anxiety/distress
- lack of recognition/feedback
- organisational (eg Employee Assistance Programmes)

### **3. Failure to match people's skills with their job**

- selection, job previews
- training/development
- competencies, job descriptions
- task analysis
- as a dynamic process
- appraisal systems

### **4. Failure to take account of other individual factors**

- diversity
  - equal opportunities issues
- work-life balance
- coping skills
- individual differences, personality
- reward systems
- career development/stagnation
- perceived effort-reward imbalance issues



- impending retirement
- job security

### **Standards grouped under 'Relationships'**

1. **\*Poorly designed/managed procedures for eliminating damaging conflict at individual/team level (bullying/harassment)**
2. **Poorly designed/managed procedures for resolving conflict at organisational level**
3. **Use of inappropriate management styles**
4. **Poorly designed/managed team working**
  - cohesiveness
  - structure
  - leadership, objectives, matrix management, style, autonomy
  - equitableness of tasks
  - effect of stressed individual on team

### **Standards grouped under 'Role'**

1. **Existence of role conflict**
  - incompatible job demands
  - job image and perceived status, 'worth'
  - status incongruity – mismatch of individual expectation and perception
2. **Inappropriate level of role ambiguity**
  - perceived ambiguity of job role
    - importance of individual preferences
  - uncertainty and change
  - need for task design at level of individual jobs
  - requirements or organisation *vs* individual expectation. Feedback
3. **Inappropriate levels of responsibility:**
  - for people (manager or carer – burnout)
  - for things (value, importance)

## **Standards grouped under 'Change'**

- 1. Lack of planned, active strategy for change**
- 2. Poorly designed/managed strategies for overcoming resistance**
  - importance of drivers
  - communication, education, negotiation
- 3. Lack of appropriate consultation with employees over change**
  - involvement
- 4. Lack of appropriate support for employees**
  - during and after change process, eg re-skilling
- 5. Poorly designed/managed new ways of working or new technology**

## **Overall**

Through all of these standards, there will need to be elements that address issues about **Organisational Culture**, *ie*:

- managing the psychosocial environment
- management strategy for employee well-being
  - management style
  - culture that engenders proactive support from managers/supervisors for employees
- management strategy for illness prevention
- well designed planning systems
- mutually compatible organisational objectives
- mechanisms for consultation and communication



## **Appendix B: Proformas**

---

# Sift and Selection Proforma for Empirical Papers

---

**Paper ID No.:**                      **Date:**                      **Reviewer:**  
**Overall status:**      **Review**                      **Hold**                      **Exclude**

**Stage 1: sifting in (3 Questions)**

*The aim is to assess whether each article:*

- *Is relevant to review subject matter*
- *Is relevant to review objectives*
- *Meets minimum quality criteria*

**Question 1: Subject Matter:.**

**What is this article about? In one or two sentences describe the central theme of the paper.**

**A) Does the paper provide information on the demands placed on the individual by the working environment, specifically any of the following? (indicate all that apply):**

*(see Appendix 1 for a detailed list)*

1. workload (*eg* quantity, pacing, time pressure or emotional content)
2. work scheduling (*eg* total hours, breaks, travel time shift work)
3. work organisation and job design (*eg* task design, team working)
4. physical environment (real and perceived danger, noise, toxins)
5. Other forms of demands (please specify below)

**B) Does the paper provide information on the levels of control or autonomy available to the individual in the working environment, specifically any of the following? (indicate all that apply):**

6. skill discretion (eg task variety, opportunity for skill use)

7. decision authority (eg perceived control &/or autonomy)

8. other forms of control/autonomy (please specify below)

**C) Does the paper provide information about support available to the individual and or interpersonal relationships in the working environment, specifically any of the following? (indicate all that apply):**

9. proactive support (practical & emotional, work & non work, feedback)

10. reactive support (ditto)

11. procedures for eliminating damaging conflict at individual/ team level (bullying/ harassment)

12. other forms of support (please specify below)

**OR**

**D) Paper does not include information about the specific variables of interest**

(please indicate overall status and stop review)

## **Question 2: Review Objectives**

**Does the paper provide information on any of the following? (indicate the main focus of the paper [1] and any other objectives [2] that might be covered):**

*Objective A* Evidence of exposure rates or incidence rates (ie broad brush, levels of incidence in the general population).

- |                    |  |                          |
|--------------------|--|--------------------------|
| <i>Objective B</i> | Evidence of the impact of exposure to a stressor ( <i>ie</i> cause and effect, evidence that stressor <i>x</i> causes outcome <i>y</i> )   | <input type="checkbox"/> |
| <i>Objective C</i> | Evidence on the link between exposure to a stressor and outcome ( <i>ie</i> what is the nature of the link between stressor <i>x</i> and outcome <i>y</i> ? Are there any moderators?) | <input type="checkbox"/> |
| <i>Objective D</i> | Organisational activity which reduces or removes the impact of stressors on health ( <i>ie</i> intervention studies)   | <input type="checkbox"/> |

**Or: Paper does not include information about any of the review objectives**

(please indicate overall status and stop review)

**Question 3: Research Type**

*The aim here is to help make judgements about the quality of the evidence reviewed based on the strength of the research design. The review is primarily concerned with more robust designs, but will draw on methodologically weaker papers in areas where no better research evidence has been identified.*

**What type of research does the paper describe?**

*Using the descriptions below, please indicate the highest level of research design under which the paper can be classified. Any queries or uncertainties indicate below for the paper to be assessed by a second reviewer.*

**Research type**

1. **Randomised Controlled Trial** (Could be relevant to objectives B, C or D).   
Experiment (lab or simulated workplace setting) where subjects are assigned randomly to exposure/treatment or control groups.
  
2. **Full field experiment** (Could be relevant to objectives B, C or D).   
As for RCTs, but conducted in field or real work setting
  
3. **Quasi - experimental design** (Could be relevant to objectives B, C or D).   
Similar to an RCT, but where one of the conditions for an experiment has been over turned (*eg* non-random assignation of subjects r to treatment or control groups)
  
4. **Other longitudinal design** (Could be relevant to all objectives).   
*IE* data collected at two or more time points. Includes:
  - Pre and post intervention measures
  - Naturally occurring experiments
  - Cross over type trials
  - Cohort or Panel studies
  - Diary studies
  - Other (*please specify*)

5. **Cross sectional design** (Could be relevant to objective A)  
 ie data collected at one time point only. Includes:

- Population survey, if sample size > 667 = **relevant to A**
- Population survey if sample size < 667 = **HOLD**
- Multiple methods **HOLD**
- Self - report **HOLD**

6. **Case Studies**

7. **Others record here, stop review & indicate overall status**

### Question 3: Minimum Quality Criteria

- A) Method of sample selection:
- Whole population**
  - Random**
  - Stratified random**
  - Purposive
  - Other non random
  - Don't know / unclear
  - Not Applicable

*(NB if sample selection is purposive, other non-random or don't know/unclear, paper should be excluded from review. Record here and indicate overall status)*

- B) Sample population:
- Working adults
  - Mixed
  - Other

*(NB if sample is **not** working adults or mixed paper should be excluded from review. Record here and indicate overall status)*

- C) Sample location:
- UK
  - Multi-national (including UK)
  - Non UK

*(NB if sample is not UK or Multinational record here and **HOLD**)*



# Sift and Selection Proforma for Meta-Analyses

---

**Paper ID No.:**

**Date:**

**Reviewer:**

**Overall status:**

**Review**

**Exclude**

**Stage 1: sifting in (3 Questions)**

*The aim is to assess whether each article:*

- *Is relevant to review subject matter*
- *Is relevant to review objectives*
- *Meets minimum quality criteria*

**Question 1: Subject Matter:.**

**What is this article about? In one or two sentences describe the central theme of the paper.**

**B) Does the paper provide information on the demands placed on the individual by the working environment, specifically any of the following? (indicate all that apply):**

*(see appendix 1 for a detailed list)*

- 13. workload (eg quantity, pacing, time pressure or emotional content)
- 14. work scheduling (eg total hours, breaks, travel time shift work)
- 15. work organisation and job design (eg task design, team working)
- 16. physical environment (real and perceived danger, noise, toxins)
- 17. Other forms of demands (please specify below)

**B) Does the paper provide information on the levels of control or autonomy available to the individual in the working environment, specifically any of the following? (indicate all that apply):**

18. skill discretion (eg task variety, opportunity for skill use)

19. decision authority (eg perceived control &/or autonomy)

20. other forms of control/autonomy (please specify below)

**C) Does the paper provide information about support available to the individual and or interpersonal relationships in the working environment, specifically any of the following? (indicate all that apply):**

21. proactive support (practical & emotional, work & non work, feedback)

22. reactive support (ditto)

23. procedures for eliminating damaging conflict at individual/team level (bullying/harassment)

24. other forms of support (please specify below)

**OR**

**E) Paper does not include information about the specific variables of interest**

(please indicate overall status and stop review)

## **Question 2: Review Objectives**

**Does the paper provide information on any of the following?**

*Objective A* Evidence of exposure rates or incidence rates (*ie* broad brush, levels of incidence in the general population).

*Objective B* Evidence of the impact of exposure to a stressor (*ie* cause and effect, evidence that stressor *x* causes outcome *y*)

**Objective C** Evidence on the link between exposure to a stressor and outcome (*ie* what is the nature of the link between stressor  $x$  and outcome  $y$ ? Are there any moderators?)

**Objective D** Organisational activity which reduces or removes the impact of stressors on health (*ie* intervention studies)

**Or: Paper does not include information about any of the review objectives**

(please indicate overall status and stop review)

### Question 3: Research Type

*The aim here is to help make judgements about the quality of the evidence reviewed based on the strength of the research design. The HSE Standards review is primarily concerned with more robust designs, but will draw on methodologically weaker papers in areas where no better research evidence has been identified.*

#### Are clear rationale given for the inclusion of papers in the review?

*Please indicate the basis on which papers have been selected for inclusion in the review or meta analysis. Any queries or uncertainties indicate below for the paper to be assessed by a second reviewer.*

**Or, No rationale for inclusion given**

(eg search method, research design etc.)

# Review Proforma for Empirical Papers relating to Objectives B, C, D

---

**Objectives B, C & D: Reviewer**

**Paper ID NO:**

Evidence for which objective? (please enter all of those that are appropriate)

- Objective B: *Impact of exposure*
- Objective C: *Evidence on the links between exposure and impact*
- Objective D: *Evidence on organisational interventions.*

Which Stressor? (enter all the stressors that paper provides evidence of)

Use the info from the Sift, but also check that specific stressors have been identified

**1. Sample and sampling strategy criteria:**

A) **Sample Frame** (please specify population from which sample was drawn, or indicate if not reported) .....

**B) Which country is the sample from?**

- 5 UK
- 4 Europe
- 3 United States
- 2 Australasia
- 1 More than one country

Other (please specify)

**C) Sampling procedure**

- 5 Random sample of working adults
- 4 Random stratified sample of working adults
- 3 Full population sample (of specific sampling frame)
- 2 Random sample of specific occupational/organisational group
- 1 Random stratified sample of specific occupational/organisational group

Other (please specify)

**D) Which statistical checks on the representativeness of the sample have been done?**

- 6 Representative random sample of working adults
- 5 Representative stratified sample of working adults
- 4 Representative population sample (of specific sampling frame)
- 3 Representative random sample of specific occupational/organisational group
- 2 Representative stratified sample of specific occupational/organisational group
- 1 Sample tested, but not representative of wider population of UK working adults or specific occupational/organisational group
- 0 representativeness not tested/not reported

Other ( <i>please specify</i> )
---------------------------------

**E) Response bias tested for?**

- 3 no response bias found
- 2 response bias found
- 1 response bias not tested for/not reported

**F), G) & H) What is the sample size and response rate at each time point, and what are the intervals between those time point**

	T1	T2	T3	T4	T5	T6
<b>F) Sample size at each time point</b>						
<b>G) Response rate at each time point</b>						
<b>H) Interval between collection times from T1 (in months, cumulatively)</b>						

## 2. Research Measures Used

### STRESSORS

A) Name of stressor measures used or description of what was measured.

B) & C) Reliability/Validity reported on? (For each measure used please rate reliability and validity 4 - 0 based on codes below)

4 existing published measures with reliability/validity reported on for the current sample

3 existing published measures, reliability/validity reported elsewhere

2 existing published measures, no reliability/validity information reported

1 ad hoc measures designed for the study but with some indication of reliability/ validity in the text of the study

0 ad hoc measures designed for the study but with no evidence on reliability/validity.

-1 not applicable (eg not a scale)

D) Sources of stressor data collected?

3 objective measures (eg rate of work, clocked hours)

2 other perceptual measure (eg manager rating)

1 Self report scale

0 self report single item

E) Time at which stressor was measured? (eg T1, T2)

### OUTCOMES

F) Name of outcome measure /description of measure

G) & H) Reliability/Validity reported on? (For each measure used please rate reliability and validity 4 - 0 based on codes below)

4 existing published measures with reliability/validity reported on for the current sample

3 existing published measures, reliability/validity reported elsewhere

2 existing published measures, no reliability/validity information reported

1 ad hoc measures designed for the study but with some indication of reliability/ validity in the text of the study

0 ad hoc measures designed for the study but with no evidence on reliability/validity.

-1 not applicable (*eg* not a scale)

**I) Sources of outcome data collected?**

- 3 objective measures (*eg* absence rates)
- 2 other perceptual measure (*eg* manager rating)
- 1 Self report scale
- 0 self report single item

**J) Time at which stressor was measured? (*eg* T1, T2)**

**3. Research Design**

**A) Was a rationale provided for the time periods chosen in relation to the stressor and outcome measures used?**

Please specify
----------------

**B) Any other relevant design features?**

Please Specify
----------------

**4. The Intervention (Objective D only)**

Please describe the intervention, including any rationale for content, design <i>etc.</i>
---

**5. Analysis criteria (repeat this section for each analysis conducted)**

**A) What type of analysis is used?**

Please specify
----------------

**B) Which major control variables were included in the analyses?**

- Negative affectivity/Neuroticism
- Gender
- Age
- Organisational or job tenure
- Previous health status (eg alcohol use, diet, smoking, exercise, illnesses)
- Baseline measure of the outcome variable
- Life events outside of work

Other (*please specify*)

- None

**C) Subject to variables ratio in full and final regression/logit/probit analyses?**

3 >20:1

2 >10: 1

1 > 5:1

0 <5:1

-1 Not Applicable

**E) Results**

**Summarise the main findings about exposure and impact in relation to each of the nine stressor areas. For each finding state the effect size and statistical probability (p) where possible.**



The effect size statistic will vary with the type of analysis used. The most common analysis methods and their associated effect size statistics are summarised below

<u>Analysis</u>	<u>Effect Size</u>	<u>Notes</u>
Multiple Regression	$R^2$ or $\Delta R^2$	if these are not reported, enter the correlation $r$ or partial correlation
(M)ANOVA	$\eta^2$	if this is not reported, enter the correlation
Logistic Regression	$R^2$	$R$ will probably be reported so square this figure to produce the pseudo- $R^2$ effect size
Loglinear analysis	$\lambda$	The lambda coefficient from chi-square
LISREL/EQS	GFI	there are various different GFIs (Goodness-of-fit indices) that could be reported here
Multi-level analysis	Beta ( $\beta$ )	if not reported, enter the B coefficient
Odds ratios	OR	just report the odds ratio value
Logit	-	interpreted through experience
Non-parametric tests	-	no effect sizes

## 6) Research Source

Who commissioned the research?

Who conducted the research?

# Review Proforma for Meta-analyses (any objective)

---

**Meta-analysis:**

**Reviewer**

**Paper ID NO:**

**Evidence for which objective? (please circle all of those that are appropriate)**

- Objective A: *Exposure or incidence of stressors*
- Objective B: *Impact of exposure*
- Objective C: *Evidence on the links between exposure and impact*
- Objective D: *Evidence on organisational interventions.*

**Which Stressor? (enter all the stressors that meta-analysis provides evidence of)**

Use the info from the Sift, but also check that specific stressors have been identified

## 2. Literature Searches:

**A) Which literature sources are used?** (please circle all of those that are used, refer to the list of papers if not actually stated in the methods text)

- Published papers
- Unpublished doctoral and MSc dissertations
- Conference papers, technical reports and other unpublished results
- Not specified
- Other (please specify) .....

**B) Which of the following search criteria are specified?** (please circle all those used and make a note of those details requested)

- Specific key words (please note them here.....)
- A specific range of years (please note them here.....)
- Countries investigated (please note them here.....)
- Search of databases of abstracts (including electronic databases)
- Manual search of the content of named key journals
- Reference lists from previous articles or literature reviews
- Contact/correspondence with researchers
- Not reported
- Other (please specify) .....

C) **How many papers are identified through the search?** (*ie. Before the papers have been selected for inclusion*) .....

D) **What inclusion criteria are employed?** *Please indicate the basis on which papers have been selected for inclusion in the review or meta analysis.*

- Specific keywords or variables were studied
- Specific definitions or measures of variable were used
- Specific research designs were used
- Specific samples were used (*eg occupation, industry, gender, age group*)
- The sample size studied was above a minimum criteria
- Other (please specify).....

E) **What is the final sample size?** *Please indicate the appropriate numbers below or if these numbers are not reported*

Papers/articles included in the meta-analysis/ review?

- Total number: .....
- Not clear/only partially reported
- Not reported

Studies included in the meta-analysis/ review? (*ie one study could lead to more than one article being published*)

- Total number: .....
- Not clear/only partially reported
- Not reported

Participants included in the meta-analysis/ review? (NB. Information on the specific sample size used to test each relationship will be asked for in section 2c., so just indicate the maximum sample size here)

- Total number: .....
- Not clear/only partially reported
- Not reported

F) **Double-counting?** Does the meta-analysis/review acknowledge and take into account the possible double-counting of participants in the sample size? *eg* if a study has led to more than one published paper?

- Acknowledges it and takes it into account
- Acknowledges it but does not take it into account
- Not reported
- Not applicable because no multiple papers from one study are included

## 2. Analysis

A) **Which corrections and checks are reported in the methodology?** (please circle all those applied, these will usually be described in the methodology section)

- Attenuation/restriction of range in the sample
- Unreliability of instruments
- Inter-rater reliability of coders
- Study quality
- None reported
- Other (please specify) .....

B) **Moderators: have the authors broken down the results by any of the following categories?** (please circle all those included, they will be described in the text and also displayed in the results tables)

- Type of stressor measure (*eg* objective record, self-report, other rating)
- Type of outcome measure (*eg* objective record, self-report, other rating)
- Research design (longitudinal design, cross-sectional)
- Occupation status of participants
- Situation or setting
- Study quality
- Gender of participants
- Age of participants
- None
- Other (please specify) .....

### C) Results

Summarise main findings of the meta-analysis in relation to each of the nine stressor and three general stressor areas. Please specify each stressor-outcome relationship and provide the following information for that relationship:

- number of samples
- number of cases/ participants
- the number of effect sizes
- the mean correlation coefficient ( $r$ ), indicating whether it is corrected or uncorrected
- the confidence interval, variability, or significance level
- which objective the relationship relates to.

### 3) Research Source

Who commissioned the meta-analysis? .....

Who conducted the meta-analysis? (name of organisation).....

Date of the meta-analysis?.....

## Appendix C: Further Articles Suitable for Review

---

A number of further articles were identified as potentially relevant. Although too late to be included in the full review, they were sifted to give an indication of the size of the literature which could potentially provide additional information on the nine stressor areas.

Adler N, Matthews K (1994), 'Health Psychology: Why Do Some People Get Sick and Some Stay Well?', *Annual Review of Psychology*, Vol. 45, pp. 229-59

Bakker A B, Schaufeli W B, Sixma H J, Bosveld W, van Dierendock D (2000), 'Patient Demands, Lack of Reciprocity, and Burnout: a Five-Year Longitudinal Study Among General Practitioners', *Journal of Organizational Behavior*, Vol. 21, No. 3, pp. 425-441

Blegen M A (1993), 'Nurses' Job Satisfaction: A Meta-Analysis of Related Variables', *Nursing Research*, Vol. 42, No. 1, pp. 36-41

Bongers P M, de Winter C R, Kompier M A, Hildebrandt V H (1993), 'Psychosocial Factors at Work and Musculoskeletal Disease', *Scandinavian Journal of Work, Environment, & Health*, Vol. 19, No. 5, pp. 297-312

Cordery J L, Mueller W S, Smith L M (1991), 'Attitudinal and Behavioral Effects of Autonomous Group Working: A Longitudinal Field Study', *Academy of Management Journal*, Vol. 34, No. 2, pp. 464-476

Cox T, Griffiths A, Barlowe C, Randall R, Thomson L, Rial-Gonzalez E (2000), *Organisational Interventions for Work Stress: A Risk Management Approach*, Health & Safety Executive, Contract Research Report 286, HSE Books

Czeisler C A, Johnson M P, Duffy J F, Brown E N, Ronda J M, Kronauer R E (1990), 'Exposure to Bright Light and Darkness to Treat Physiologic Maladaptation to Night Work', *The New England Journal of Medicine*, Vol. 322, No. 18, pp. 1253-1259

- Fenwick R, Tausig M (2001), 'Scheduling Stress: Family and Health Outcomes of Shift Work and Schedule Control', *American Behavioral Scientist*, Vol. 44, No. 7, pp. 1179-1189
- Fletcher B C, Jones F (1993), 'A Refutation of Karasek's Demand-Discretion Model of Occupational Stress With a Range of Dependent Measures', *Journal of Organizational Behavior*, Vol. 14, pp. 319-330
- Frese M (1985), 'Stress at Work and Psychosomatic Complaints: A Causal Interpretation', *Journal of Applied Psychology*, Vol. 70, No. 2, pp. 314-328
- Gastill J (1994), 'A Meta-Analytic Review of the Productivity and Satisfaction of Democratic and Autocratic Leadership', *Small Group Research*, Vol. 25, No. 3, pp. 384-410
- Glomb T M, Munson L J, Hulin C L, Bergman M E, Drasgow F (1999), 'Structural Equation Models of Sexual Harassment: Longitudinal Explorations and Cross-Sectional Generalizations', *Journal of Applied Psychology*, Vol. 84, No. 1, pp. 14-28
- Holcom M L, Lehman W E K, Simpson D D (1993), 'Employee Accidents: Influences of Personal Characteristics, Job Characteristics and Substance use in Jobs Differing in Accident Potential', *Journal of Safety Research*, Vol. 24, No. 4, pp. 205-221
- Irvine D M, Evans M G (1995), 'Job Satisfaction and Turnover Among Nurses: Integrating Research Findings Across Studies', *Nursing Research*, Vol. 44, No. 4, pp. 246-253
- Jackson P R, Martin R (1996), 'Impact of Just-In-Time on Job Content, Employer Attitudes and Well-Being: A Longitudinal Study', *Ergonomics*, Vol. 39, No. 1, pp. 1-16
- Karasek R A Jr (1979), 'Job Demands, Job Decision Latitude and Mental Strain: Implications for Job Redesign', *Administrative Science Quarterly*, Vol. 24, pp. 285-311
- Kelly J (1992), 'Does Job Re-Design Theory Explain Job Re-Design Outcomes?', *Human Relations*, Vol. 45, No. 8 pp. 753-774
- Kirjonen J, Hänninen V (1984), 'Effects of a Job Change on Job Satisfaction and Mental Strain', *Scandinavian Journal of Work, Environment & Health*, Vol. 10, pp. 517-519
- Kohn M L, Schooler C (1981), 'Job Conditions and Personality: A Longitudinal Assessment of Their Reciprocal Effects', *American Journal of Sociology*, Vol. 87, No. 6

- Landsbergis P A, Cahill J, Schnall P (1999), 'The Impact of Lean Production and Related New Systems of Work Organization on Worker Health', *Journal of Occupational Health Psychology*, Vol. 4, No. 2, pp. 108-130
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- Oliver L W, Harman J, Hoover E, Hayes S M, Pandhi N A (1999), 'A Quantitative Integration of the Military Cohesion Literature', *Military Psychology*, Vol. 11, No. 1, pp. 57-83
- Parker S K, Jackson P R, Sprigg C A, Whybrow A C (1998), *Organisational Interventions to Reduce the Impact of Poor Work Design*, Health & Safety Executive, Contract Research Report 3321/R567.09, HSE Books
- Parker S K, Sprigg C A (1999), 'Minimizing Strain and Maximizing Learning: The Role of Job Demands, Job Control and Proactive Personality', *Journal of Applied Psychology*, Vol. 84, No. 6, pp. 925-939
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- Parkes K R (1995), 'The Effects of Objective Workload on Cognitive Performance in a Field Setting: A Two-Period Cross-Over Trial', *Applied Cognitive Psychology*, Vol. 9, pp. S153-S171, John Wiley & Sons
- Parkes K R, with Anastasiades P, Johnston D, Broadbent D E, Rendall D, Mathews J, Smith A P (1986), *Occupational Stress Among Driving Examiners: An Investigation of the Effects of Workload Reduction*, final report and recommendations prepared under Health & Safety Executive commission, 1/MS/126/158/79. Dept of Experimental Psychology, University of Oxford
- Parkes, K R (1989), 'Personal Control in an Occupational Context', in A Steptoe, A Appels (eds), *Stress, Personal Control and Health*, Chapter 2, pp. 21-47, John Wiley & Sons



- Schnall P L, Landsbergis P A, Baker D (1994), 'Job Strain and Cardiovascular Disease', *Annual Review of Public Health*, Vol. 15, pp. 381-411
- Schweiger D M, Denisi A S (1991), 'Communication With Employees Following a Merger: A Longitudinal Field Experiment', *Academy of Management Journal*, Vol. 34, No. 1, pp. 110-135
- Smith A (2001), 'Perceptions of Stress at Work', *Human Resource Management Journal*, Vol. 11, No. 4, pp. 74-86
- Sparks K, Cooper C L, Fried Y, Shirom A (1997), 'The Effects of Hours of Work on Health: A Meta-Analytic Review', *Journal of Occupational and Organizational Psychology*, Vol. 70, pp. 391-408
- Tenkanen L, Sjöblom T, Kalimo R, Alikoski T, Härmä M (1997), 'Shift Work, Occupation and Coronary Heart Disease Over 6 Years of Follow-Up in the Helsinki Heart Study', *Scandinavian Journal of Work, Environment & Health*, Vol. 23, pp. 257-265
- Uchino B N, Cacioppo J T, Kiecolt-Glaser J K (1996), 'The Relationship Between Social Support and Physiological Processes: A Review with Emphasis on Underlying Mechanisms and Implications for Health', *Psychological Bulletin*, Vol. 119, No. 3, pp. 488-531
- Vahtera J, Kivimäki M, Pentti J, Theorell T (2000), 'Effect of Change in the Psychosocial Work Environment on Sickness Absence: A Seven Year Follow Up of Initially Healthy Employees', *Journal of Epidemiology and Community Health*, Vol. 54, pp. 484-493
- Van der Doef M, Maes S (1998), 'The Job Demand-Control (-Support) Model and Physical Health Outcomes: A Review of the Strain and Buffer Hypotheses', *Psychology and Health*, Vol. 13, pp. 909-936



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