The work environment, stress and well-being

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Introduction

In the last two to three decades, there has been a large body of research on work characteristics and their association with both negative job outcomes, such as stress and dissatisfaction, and physical and mental ill-health (see [1–3]). However, more recently, there has been a growing awareness and acknowledgement that, while unemployment is harmful to physical and mental health, work is often beneficial and may be an effective way to improve health and well-being [4]. These approaches reflect a growing interest in stress and well-being, as shown in the UK government’s Foresight project on Mental Capital and Well-being, which explored how mental capital is enhanced or depleted throughout the life course [5].

Cooper [6] has argued that research on the effects of occupational stress must be integrated with the positive orientation of work and well-being. A significant section of the newer literature focuses on how work can be improved [7]. The implicit assumption behind some of this research seems to be that the absence or removal of negative factors is the same as the presence or addition of positive factors. Warr’s work [8,9] is a notable exception to this, suggesting that ‘an absence of the primary environmental characteristics leads to unhappiness, but that their presence beyond a certain level does not further increase happiness’. Similarly, another significant body of work considers that a job’s ‘goodness’ is multifactorial [10] and that various aspects of this goodness (such as job satisfaction) can be measured [11], with some jobs having more of it than others. Here the implicit assumption seems to be that some work characteristics are associated with ‘goodness’. However, again this could represent the absence of negative factors and/or the presence of positive factors.

From the existing literature, it is not possible to determine whether the absence of negative work factors is in fact the same as the presence of positive work factors. In order to examine these issues, a set of secondary analyses of existing datasets were conducted. Specifically, the analyses were designed to assess the types of associations present between a range of dependent and independent variables to consider the associations between the presence/absence of negative/positive job characteristics and negative/positive outcomes. For example, social support...
at work has been shown to be associated with positive outcomes (e.g. increased job satisfaction). It is important to know whether the absence of social support has a similar effect on negative outcomes (e.g. stress). Similar analyses examining negative job characteristics (e.g. high demands) will complete the profile of the relative importance of absence/presence of different job characteristics and outcomes. It is also clear from many studies [1,12–14] that a wide range of other demographic and occupational characteristics also influence well-being and health. It was therefore important that such potentially confounding factors were controlled for in the analyses.

In summary, this methodological paper aimed to explore the associations between job characteristics and mental health and well-being using an approach designed to compare effect sizes related to the presence and absence of different job characteristics.

**Methods**

Analyses were carried out using the combined datasets of the Bristol and Cardiff Community Studies [1,12,13], which were designed to examine occupational stress and health at work. The surveys contained information from 8755 workers. Both studies were postal questionnaire surveys of samples selected at random from the electoral registers of Bristol (n = 17 000) in southwest England [1] and Cardiff (n = 22 500) and Merthyr Tydfil (n = 7500) in South Wales [12,13]. All questionnaires were returned anonymously and response rates for the two surveys were 49% (using follow-up mailing and telephone procedures) and 27% (using no follow-up procedures), respectively. Similar questionnaires, including questions relating to demographics, health, work and lifestyle, were used in each study. The methods and questionnaires are described in more detail elsewhere [1,12,13]. The Cardiff Community study [12,13] was approved by the Cardiff University School of Psychology Ethics Committee. The Bristol Community study [1] was carried out with the approval of the local regional ethical committee.

All analyses were carried out in SPSS (version 16.0). The variables of interest included both positive and negative dependent and independent variables: work-related stress and job satisfaction; and job demand, extrinsic effort and social support, respectively. They are summarized in Table 1.

Independent variables were split into quintiles to allow comparisons of those with low or high levels of a job characteristic, such as job demand, with those with moderate levels (those in the middle).

Logistic regression analyses were used to consider the associations between the dependent and independent variables of interest. Demographic (sex, age, marital status, education and income), occupational (social class, full-time or part-time) and job characteristics (other positive and negative job characteristics) were also included in the analyses to allow any associations between the variables of interest to be considered independent of these potentially confounding factors. These variables are summarized in Table 2.

**Results**

Using the present approach to consider associations between job characteristics and mental health and well-being allowed us to explore three possible kinds of association:

- Both presence and absence: where the presence and absence effect sizes were equal.
- Presence: in which the presence effect size was significantly greater than the absence effect size.
- Absence: in which the absence effect size was significantly greater than the presence effect size.

Table 1. Variables of interest

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Score (mean, SD, minimum, maximum)</th>
<th>Above cut-point n (%)</th>
<th>Pattern of response identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived stress</td>
<td>Single 5-point item scored 0 (not at all) to 4 (extremely stressful), cut-point 3 or more (very or extremely)</td>
<td>1.75, 0.93, 0, 4</td>
<td>1669 (19)</td>
<td></td>
</tr>
<tr>
<td>Job satisfaction</td>
<td>Seven 4-point items scored 0 (very satisfied) to 3 (very dissatisfied), each recoded so 1 indicated satisfied or very satisfied and 0 indicated dissatisfied or very dissatisfied, and then summed.</td>
<td>5.09, 1.89, 0, 7</td>
<td>2665 (31)</td>
<td></td>
</tr>
<tr>
<td>Job demand</td>
<td>Job Content Questionnaire [15], score 0–100, high score = high demand</td>
<td>55.75, 23.10, 0, 100</td>
<td>NA</td>
<td>Presence association</td>
</tr>
<tr>
<td>Extrinsic effort</td>
<td>Effort–reward imbalance [16], score 0–100, high score = high effort</td>
<td>21.99, 20.51, 0, 100</td>
<td>NA</td>
<td>Both presence and absence association</td>
</tr>
<tr>
<td>Social support</td>
<td>Job content questionnaire, score 0–100, high score = high support</td>
<td>64.93, 26.34, 0, 100</td>
<td>NA</td>
<td>Absence association</td>
</tr>
</tbody>
</table>
Of the 52 analyses carried out, 28 (54%) suggested both a presence and an absence association, 10 (19%) a presence-type association and 3 (6%) an absence-type association [the remaining 11 (21%) were not significant]. An example of each is presented below.

After controlling for the potentially confounding factors, extrinsic effort was strongly independently associated with work stress ($P < 0.001$) (Table 3). This is shown using both the middle and the very low extrinsic effort groups as the reference category so that very high and very low extrinsic efforts, with reference to the middle group, can be directly compared. A formal comparison was made by including extrinsic effort in quintiles and a dummy very high extrinsic effort variable (where those in the very high extrinsic effort group were compared with all others) in a single analysis. The odds ratio (OR) for the dummy variable, which is equivalent to the relative ratio of very high and very low extrinsic effort (3.21/2.40), was 1.34 (Table 3). This shows that the very high extrinsic effort effect is greater than the very low extrinsic effort effect, but the $P$-value indicates that this difference is not significant. This is illustrated in Figure 1A where the superimposed line joining adjacent OR bars has a relatively unchanging gradient.

After controlling for the potentially confounding factors, the association between job demand and work stress was equally strong ($P < 0.001$) (Table 4). Using the approach described above, however, showed a significant difference between very high and very low job demand [relative ratio (RR) = 2.84, $P < 0.001$], indicating that the effect size for the presence effect (very high job demand) was significantly greater than that for the absence effect (very low job demand) (Table 4). This is illustrated in Figure 1B where the gradient of the superimposed line joining adjacent ORs is greater over its second half.

Similarly, there was a strong independent association between job satisfaction and social support ($P < 0.001$) (Table 5). However, in this case, the absence of social support was significantly greater than the presence of social support (RR = 0.65, $P < 0.05$) (Table 5), as illustrated by the steeper gradient over the first half of the superimposed line joining adjacent ORs (Figure 1C).

**Discussion**

The analyses described above have shown that the nature of the relationship between job characteristics and mental

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**Table 2. Other variables included in the analyses**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Score (mean, SD, minimum, maximum)</th>
<th>$n$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Single item indicating male or female</td>
<td>NA</td>
<td>Male: 3987 (46)</td>
</tr>
<tr>
<td>Age</td>
<td>Single item indicating age in years</td>
<td>40.32, 11.99, 16, 82</td>
<td>NA</td>
</tr>
<tr>
<td>Income</td>
<td>Single 4-point item, categories: £10 000; £10 000 to £20 000; £20 000 to £30 000 or more</td>
<td>NA</td>
<td>£10 000: 2146 (25)</td>
</tr>
<tr>
<td>Education</td>
<td>Single 6-point item, categories: None; GCSE or equivalent; A level or equivalent; Further education; Degree; Higher degree or professional qualification</td>
<td>NA</td>
<td>None: 1052 (13)</td>
</tr>
<tr>
<td>Social class</td>
<td>Single item indicating groups I, II, IIINM or IIIM, IV, V</td>
<td>NA</td>
<td>I, II, IIINM: 6126 (71)</td>
</tr>
<tr>
<td>Marital status</td>
<td>Single item indicating groups Married/cohabiting or Other</td>
<td>NA</td>
<td>Married/cohabiting: 5993 (69)</td>
</tr>
<tr>
<td>Full- or part-time</td>
<td>Single item indicating full- or part-time employment</td>
<td>58.94, 19.50, 0, 100</td>
<td>NA</td>
</tr>
<tr>
<td>Control</td>
<td>Job Content Questionnaire, score 0–100; in quintiles</td>
<td>45.44, 21.66, 0, 100</td>
<td>NA</td>
</tr>
<tr>
<td>Intrinsic effort</td>
<td>Effort–reward imbalance, score 0–100; in quintiles</td>
<td>14.21, 17.48, 0, 100</td>
<td>NA</td>
</tr>
<tr>
<td>Reward</td>
<td>Effort–reward imbalance, score 0–100; in quintiles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Table 3. Association between extrinsic effort and perceived work stress: both presence and absence association**

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>CI</th>
<th>OR</th>
<th>CI</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>0.42</td>
<td>0.29–0.60</td>
<td>1.00</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Low</td>
<td>0.70</td>
<td>0.51–0.95</td>
<td>1.68</td>
<td>1.13–2.48</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>1.00</td>
<td></td>
<td>2.40</td>
<td>1.66–3.46</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1.73</td>
<td>1.38–2.17</td>
<td>4.14</td>
<td>2.94–5.85</td>
<td></td>
</tr>
<tr>
<td>Very high</td>
<td>3.21</td>
<td>2.55–4.05</td>
<td>7.71</td>
<td>5.40–11.01</td>
<td></td>
</tr>
<tr>
<td>Comparing high and low extrinsic effort</td>
<td>RR</td>
<td>CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very high/very low</td>
<td>1.34</td>
<td>0.81–2.21</td>
<td></td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

CI, confidence interval.
health and well-being outcomes can vary markedly. Three examples, each showing a different type of association, have been presented illustrating both presence and absence, presence-only and absence-only associations. Specifically, the association between extrinsic effort and work stress showed that the size of the low and high extrinsic effort effects was not significantly different. In contrast, the analysis of job demand and work stress suggested a presence-type association, where the effect size of high job demand was significantly greater than the effect size of low job demand. Finally, the analysis of social support and job satisfaction suggested an absence-type association, where the effect size of low social support was significantly greater than the effect size of high social support.

The relative frequencies of these three types of association are potentially important for policy since a linear dose–response would indicate that changes made at any level will improve the outcome, while an absence would represent a threshold effect, which means that trying to change high levels would have little impact (the opposite would be true for a presence effect). The three examples presented here raise the possibility that the nature of such associations may vary according to whether the measures involved are of positive or negative job characteristics or outcomes. However, our data, in common with many other datasets, contain relatively fewer positive as compared to negative measures (4 and 11 measures, respectively) of both job characteristics and mental health and well-being outcomes, so our analyses comprised 25 procedures where both the job characteristic and the outcome were negative measures, 24 where one was negative and one was positive, and just 3 where both were positive. We were, therefore, not able to explore this issue fully. It is possible that data with more varied measures of work, workplace and health and safety outcomes may contain more varied associations. In addition, the data used here were collected as part of two studies, both of which had

### Table 4. Association between job demand and perceived work stress: presence association

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>CI</th>
<th>OR</th>
<th>CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>0.93</td>
<td>0.66–1.30</td>
<td>1.00</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Low</td>
<td>0.85</td>
<td>0.64–1.13</td>
<td>0.92</td>
<td>0.66–1.27</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>1.00</td>
<td>1.08</td>
<td>0.77–1.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1.54</td>
<td>1.22–1.95</td>
<td>1.66</td>
<td>1.23–2.24</td>
<td></td>
</tr>
<tr>
<td>Very high</td>
<td>3.06</td>
<td>2.40–3.91</td>
<td>3.30</td>
<td>2.43–4.49</td>
<td></td>
</tr>
</tbody>
</table>

Comparing high and low job demand

<table>
<thead>
<tr>
<th>RR</th>
<th>CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high/very low</td>
<td>2.84</td>
<td>1.73–4.69</td>
</tr>
</tbody>
</table>

CI, confidence interval.

### Table 5. Association between social support and job satisfaction: absence association

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>CI</th>
<th>OR</th>
<th>CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>0.28</td>
<td>0.22–0.36</td>
<td>1.00</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Low</td>
<td>0.76</td>
<td>0.63–0.93</td>
<td>2.69</td>
<td>2.10–3.45</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>1.00</td>
<td></td>
<td>3.52</td>
<td>2.76–4.49</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1.62</td>
<td>1.36–1.92</td>
<td>5.69</td>
<td>4.53–7.14</td>
<td></td>
</tr>
<tr>
<td>Very high</td>
<td>2.28</td>
<td>1.88–2.76</td>
<td>8.02</td>
<td>6.31–10.20</td>
<td></td>
</tr>
</tbody>
</table>

Comparing high and low social support

<table>
<thead>
<tr>
<th>RR</th>
<th>CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high/very low</td>
<td>0.65</td>
<td>0.45–0.93</td>
</tr>
</tbody>
</table>

CI, confidence interval.

low job demand. Finally, the analysis of social support and job satisfaction suggested an absence-type association, where the effect size of low social support was significantly greater than the effect size of high social support.

The relative frequencies of these three types of association are potentially important for policy since a linear dose–response would indicate that changes made at any level will improve the outcome, while an absence would represent a threshold effect, which means that trying to change high levels would have little impact (the opposite would be true for a presence effect). The three examples presented here raise the possibility that the nature of such associations may vary according to whether the measures involved are of positive or negative job characteristics or outcomes. However, our data, in common with many other datasets, contain relatively fewer positive as compared to negative measures (4 and 11 measures, respectively) of both job characteristics and mental health and well-being outcomes, so our analyses comprised 25 procedures where both the job characteristic and the outcome were negative measures, 24 where one was negative and one was positive, and just 3 where both were positive. We were, therefore, not able to explore this issue fully. It is possible that data with more varied measures of work, workplace and health and safety outcomes may contain more varied associations. In addition, the data used here were collected as part of two studies, both of which had

![Figure 1](image-url). (A) Association between extrinsic effort and perceived work stress: both presence and absence association. (B) Association between job demand and perceived work stress: presence association. (C) Association between social support and job satisfaction: absence association.
relatively low response rates and only one of which measured negative affectivity. It is, therefore, also important to replicate these analyses in samples with higher response rates, which include measures of such potential confounders, to address the possible effects of response and other biases in the data analysed here.

Nonetheless, the three examples presented here suggest that a ‘one-size fits all’ approach to this area may not always be appropriate. Indeed, Warr [8] has pointed to the need to adopt an approach like the one described here, particularly, in relation to positive aspects of work. This kind of possibility, to which the social support and job satisfaction analyses presented above may perhaps offer some tentative support, cannot be explored without using an approach such as the one described here.

A recent meta-analytic review identified consistent evidence showing that particular (combinations of) negative job characteristics are prospective risk factors for common mental disorders [17]. In addition, longitudinal research has shown that work stressors are an important source of preventable psychiatric diagnoses in midlife [18]. It is crucial, therefore, that we are able to understand, as well as clearly define and map, associations between job characteristics (both negative and positive) and mental health and well-being. Future research should explore the nature of such associations in more detail using a variety of approaches.

### Key points

- Much recent work extending the field of job characteristics to include positive aspects of work makes the implicit assumption that the absence of negative work characteristics is equivalent to the presence of positive work characteristics.
- However, the analyses in this paper suggest that this assumption is not always appropriate.
- The nature of such associations should be explored in more detail using a variety of approaches.

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Institution of Occupational Safety and Health.

### Acknowledgements

We would like to thank the members of our steering committee and in particular Dr Chris Metcalfe for all his expert statistical advice.

### Conflicts of interest

None declared.

### References