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Coping processes linking the Demands-Control-Support model, affect and risky
decisions at work

Kevin Daniels, Business School, Loughborough University, Leicestershire, LE11 3TU,
United Kingdom

Email: k.j.daniels@lboro.ac.uk, Tel: +44 1509 222720, Fax: +44 1509 223962

Nick J. Beesley, Business School, Loughborough University, Leicestershire, LE11 3TU,
United Kingdom

Email: n.j.beesley2@lboro.ac.uk, Tel: +44 1509 2231779, Fax: +44 1509 223962

Alistair J.T. Cheyne, Business School, Loughborough University, Leicestershire, LE11 3TU,
United Kingdom

Email: a.j.t.cheyne@lboro.ac.uk, Tel: +44 1509 222162, Fax: +44 1509 223962

Varuni P. Wimalasiri, Business School, Loughborough University, Leicestershire, LE11
3TU, United Kingdom

Email: v.p.wimalasiri@lboro.ac.uk, Tel: +44 1509 2231779, Fax: +44 1509 223962

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Coping processes linking the Demands-Control-Support model, affect and risky decisions at work

Abstract

As a model of job design, the demands-control-support model (DCSM) indicates that dynamic processes involving individual agency underpin the effects of job characteristics. Specifically, the DCSM indicates that control and social support facilitate effective coping with work demands. To examine such processes in detail, 32 nuclear design engineers participated in an experience sampling study (no. observations = 456). Findings indicate that enacting problem-focused coping by control and support across situations may be beneficial for affect. Problem-focused coping enacted by control was also related to fewer decisions that bear risks to design safety. Although higher levels of risky decisions were related to consistent use of emotional-approach enacted by control coping across situations, this form of coping used in specific demanding episodes was related to less cognitive error and fewer risky decisions two hours later. Emotional-approach enacted through support in specific episodes had a mixed pattern of relationships with outcomes. Theoretically, the findings indicate the importance of understanding the purpose for which job characteristics are enacted. Practically, the findings indicate the importance of shaping both problem-solving and emotional processes alongside job redesign.

Keywords: job design, job characteristics, demands-control-support model, coping, well-being, risk, safety.

Interest in the design of jobs has a long and continuing history (e.g. Trist & Bamforth, 1951; Coupland, Blyton & Bacon, 2005). The transfer, interpretation and manipulation of information and flexible working practices typify contemporary work environments (Sparrow, 2003; Tregaskis & Brewster, 2006). In such contexts, the ways in which people approach their work roles can have important organisational consequences (Parker, 2007). Therefore, one recent and important strand of research concerns how job characteristics are enacted (Noon & Blyton, 1997; Wrzesniewski & Dutton, 2001).

This study is concerned with the processes by which job characteristics are enacted and the purposes for which they are enacted, particularly in connection to well-being and risk taking at work. In examining the purposes of enactment, this study relates to research on proactive behaviour as an element of work performance (cf. Griffin, Neal & Parker, 2007). The vehicle we use is Karasek and Theorell's (1990) influential demands-control-support model (DCSM). Central to the model is the idea that support and control promote effective coping with work demands. We use experience sampling methodology to investigate ways in which the processes underpinning DCSM can be elaborated. We do this by examining the coping purposes or functions for which individuals enact control and support.

The Demands, Control, Support Model

In the DCSM, demands are considered to be primarily psychological, and relate to phenomena such as high workplace, time pressures and difficult work. Control over decisions concerning the job is thought to interact with demands to buffer demands' adverse impact (Karasek & Theorell, 1990; Wall, Jackson, Mullarkey & Parker, 1996). Support, defined as helpful interaction with supervisors and co-workers, is also thought to buffer demands' impact (Karasek & Theorell, 1990).

There are many studies that indicate components of the DCSM are related to a range of indicators of well-being and organisational functioning (e.g. de Lange, Taris, Kompier, Houtman & Bongers, 2003; Elfering, Semmer & Grebner, 2006; Parker, Axtell & Turner, 2001; Karasek & Theorell, 1990; Turner, Chmiel & Walls, 2005; van der Doef & Maes, 1999). Much of the debate concerning the model has revolved around the hypotheses that interactions between demands, control and support explain variance beyond their main effects. Most studies have been concerned with well-being, and across these studies, there is little support for these hypotheses (de Lange et al., 2003).

One problem with many tests of the hypothesised interactions is that they do not necessarily match the underpinning explanation in the DCSM of the beneficial effects of control and support (van Vegchel, de Jonge & Landsbergis, 2005). Generalised assessments of perceptions of control, support and demands characterise most research on the DCSM (de Lange et al., 2003). Such measures rarely reflect individuals' agency in shaping their jobs (Daniels, 2006). However, agency is prominent in the explanation of how control and support operate (Karasek & Theorell, 1990). Specifically, Karasek and Theorell argue both control and support, rather than being necessarily beneficial in their own right, enable more effective coping with work demands. They argue control enables individuals to engage in active problem-solving to deal with work demands, which in turn fosters both better well-being and performance (see also Parker, Turner & Griffin, 2003). Karasek and Theorell argue that workplace support can facilitate problem-solving, but also that relationships at work can be a source of emotional support. Karasek and Theorell are explicit that the benefits of control and support accumulate over time as a function of the dynamic processes associated with coping. Indeed, there is evidence that dynamic processes underpin elements of the DCSM (Teuchmann, Totterdell & Parker, 1999; Totterdell, Wood & Wall, 2006).

The principles embedded with the DCSM, namely that control and support enable coping with demands and that these coping processes are dynamic, are important for understanding links between demands, control and support on the one hand, and indicators of well-being and risk-taking on the other. In the following sections, we explore these principles in more detail.

Coping, control and support

Coping comprises of many facets, including the coping function, which is the target of coping (Lazarus, 1999; Skinner, Edge, Altman & Sherwood, 2003). Typologies of coping include many different functions (e.g. Skinner et al., 2003). Two of the most prominent functions relate to problem-focused and emotion-focused coping (Folkman & Lazarus, 1980). These functions are the most relevant to how Karasek and Theorell conceive the processes by which control and support ameliorate the effects of demands. Problem-focused coping is targeted at solving problems, and reflects the problem-solving Karasek and Theorell consider to be facilitated by control and support. Emotion-focused coping is targeted at regulating emotional distress, and reflects the provision of emotional support. One particular form of emotion-focused coping is emotional-approach coping, which involves the active expression of emotions (Baker & Berenbaum, 2007; Stanton & Franz, 1999). This is important, since expressing emotions to others in supportive relationships is thought to produce emotional benefits, such as empathic understanding of emotional difficulties (Clark & Finkel, 2004; House, 1981).

Another important facet of coping is coping behaviour. Coping behaviours are used to fulfil coping functions (cf. Lazarus, 1999). In relation to the DCSM, the execution of control or elicitation of support are behaviours that can be used to fulfil coping functions. As an example of executing control for problem-focused coping, rescheduling work tasks may allow someone to spend more time on a work problem to resolve it. Coping behaviours can be used to fulfil more than one function, and one coping function can be fulfilled by multiple

behaviours. Therefore, coping behaviours need to be linked to functions in an explicit way to determine whether particular behaviours are more or less effective for particular functions (Skinner et al., 2003).

To illustrate these points in relation to the DCSM, support is thought to enable both problem-focused and emotional-approach coping. On the other hand, problem-focused coping can be enacted both by executing control and/or by eliciting support. Whilst not considered within the DCSM, it is also possible that executing control could facilitate emotional-approach coping (Daniels & Harris, 2005). For example, re-arranging work schedules to allow one to take a break from work may provide a chance to get away from co-workers in order to vent one's emotions in privacy. To summarise, it is possible that both problem-focused and emotional-approach coping could be enacted by executing control. Similarly, both problem-focused and emotional-approach coping could be enacted by eliciting support.

Another distinction concerns the difference between the coping used in a particular context in relation to a particular episode and cross-situational consistency in coping, which over the longer term may be seen as a coping style (Cooper, Dewe & O'Driscoll, 2001). As an emergent property of coping in particular episodes, cross-situational consistency can be thought of as similarity in a person's coping across time reflected in average levels of a given type of coping for a given person (Chan, 1998). As such, cross-situational consistency reflects differences between people in their average levels of coping. Cross-situational consistency in coping may have different relationships with well-being and performance than coping assessed in relation to a specific episode. In the DCSM, cross-situational consistency in coping appears to be more important than episodic coping. Karasek and Theorell argue that the benefits of coping enacted through control and support accrue over time, and therefore across episodes. The effectiveness of episodic coping can vary over the time course of an episode (Lazarus, 1999), and

so it is conceivable that episodic coping can have different effects over time. For example, effects can be immediate, delayed or both (Daniels & Harris, 2005).

INSERT TABLE 1 HERE

Table 1 summarises the various aspects of coping examined here. In summary, these concern distinctions between coping behaviours, coping functions, cross-situational consistency in coping versus episodic coping and the temporal sequencing of the effectiveness of episodic coping.

Hypotheses

On a broad level, it is advised that assessments of coping should be tied to specific stressors (Dewe & Cooper, 2007). In relation to the DCSM, it is important to match coping resources to specific stressors (de Jonge & Dormann, 2006). Moreover, in the DCSM, problem-solving is thought to contribute to better well-being (Karasek & Theorell, 1990). Therefore, to reflect the micro-processes underpinning the DCSM, the focus of the study is coping enacted by control and support in relation to problem-solving demands.

Our questions concern two major groups of variables: psychological well-being and making work decisions that bear some risk to safety. Decisions that bear risk to safety may be seen as antecedents to occupational accidents (cf. Barling, Loughlin & Kelloway, 2002) and hence the antithesis of safe working (Clarke, 2006). Empirically, it is well established that demands, control, support and coping are related to psychological well-being (e.g. de Lange et al., 2003). In relation to safety, there are studies that have found relationships between safer behaviours in the workplace and demands, control and/or support (Elfering et al., 2006; Parker et al., 2001; Turner et al., 2005).

The notion that consistent use of problem-focused coping enacted by control is beneficial for well-being is central to the DCSM, and reflects predictions concerning

differences between people in different jobs (Karasek & Theorell, 1990). Problem-focused coping is thought to protect well-being by preventing problems persisting or ensuring progress is maintained towards personal goals in spite of demands (Daniels, Harris & Briner, 2004). There is evidence that job autonomy is related to problem-oriented coping (Ito & Brotheridge, 2003), that job autonomy and problem-focused coping jointly buffer the impact of job demands (Daniels, 1999; de Rijk, Le Blanc, Schaufeli, & de Jonge, 1998) and problem-focused coping enacted by control is associated with subsequent reports of goal progress (Daniels & Harris, 2005).

In relation to minimising risky decisions, there are at least two processes relevant to problem-focused coping enacted by control. First, there is a motivational process. Studies have found safety commitment and safety motivation to be related to behaviours such as compliance with safety procedures and promotion of safety in the workplace (Hoffman & Morgeson, 1999; Neal, Griffin & Hart, 2000; Neal & Griffin, 2006). By protecting well-being, coping enacted by control and support may foster motivation to minimise decisions that bear risks to safety as part of a social exchange process with the organisation (cf. Hofmann & Morgeson, 1999; Michael, Evans, Jansen & Haight, 2005). However, any motivational process would act to minimise risky decisions only where risks are framed in terms of losses (injuries, lost time, cf. Sitkin & Weingart, 1995).

The third process is through cognitive interference. Individuals may be distracted from their work tasks by the affective impact of demands and because cognitive resources are needed in order to cope with the impact of demands (Beal, Weiss, Barros & MacDermid, 2005). Such distraction may interfere with the cognitive processes needed to perform work tasks (e.g. difficulty remembering information, sustaining attention, Elfering et al., 2006; Wallace & Vodanovich, 2003). Because consistent use of problem-solving enacted by control is considered to be an effective means of minimising the impact of demands, then distraction

from work tasks and cognitive interference may be minimised, allowing individuals the chance to assign a higher priority to minimising risks to safety (Parker et al., 2003).

Therefore, we expect:

Hypothesis 1: Consistent use of problem-focused coping enacted by control is associated with higher levels of well-being and fewer risky decisions.

Problem-focused coping enacted through support too may be associated with well-being and fewer risky decisions at work. There is evidence that workplace support is related to problem-oriented coping (Ito & Brotheridge, 2003), problem-focused coping and support jointly buffer the effects of work stressors on well-being (Daniels, 1999) and problem-focused coping enacted through support is related to affective well-being (Daniels & Harris, 2005). Support has also been related to safer working practices (Parker et al., 2001). The reasons why problem-focused coping enacted through support may influence well-being and risky decisions are similar to those for problem-focused coping enacted by control. However, there is an additional process related to information exchange, in which individuals gain information from others on safe working practices (Zacharatos, Barling & Iverson, 2005). In the DCSM, it is the consistent use of problem-solving that is thought to be beneficial. Therefore:

Hypothesis 2: Consistent use of problem-focused coping enacted through support is associated with higher levels of well-being and fewer risky decisions.

In the DCSM, emotional-approach coping enacted through support is considered beneficial. However, many reviews indicate that emotional-oriented coping is not beneficial for well-being (Austenfeld & Stanton, 2004). Even so, it is argued that active processing and expression of emotions through emotional-approach coping can be beneficial, at least in some conditions (Austenfeld & Stanton, 2004; Lazarus, 1999). Whilst the arguments concerning emotional-approach have concerned relationships with well-being, emotional-approach may

also be related to risky decisions. Again, there are two possible perspectives. If emotional-approach enacted through support is maladaptive, then it is likely to divert attention away from work tasks, increasing the chances of risky decisions (cf. Beal et al., 2005). However, if it is successful, then any cognitive interference induced by demands will be minimised, allowing time and motivation to make decisions that are less risky.

Emotional-approach coping could be beneficial in a receptive social context (Austenfeld & Stanton, 2004; Clark & Finkel, 2004). However, expressing emotions to others at work may be considered inappropriate or indicative of incompetence (Ashforth & Humphrey, 1995). In occupational samples, use of emotional support has been found to be correlated with anxiety (Lowe & Bennett, 2003) and impaired progress towards personal goals (Daniels & Harris, 2005). These results suggest that emotional-approach enacted through support is maladaptive in organisational contexts, and may occur regardless of whether emotional-approach enacted through support is used consistently or just for specific situations. However, this runs counter to the hypothesised benefits of emotional support in the DCSM. Therefore, this suggests two opposing hypotheses:

Hypothesis 3a: Emotional-approach coping enacted through support is associated with higher levels of well-being and fewer risky decisions.

Hypothesis 3b: Emotional-approach coping enacted through support is associated with lower levels of well-being and more risky decisions.

Because emotional-approach enacted by control need not involve expression to others, it could be argued that this form of coping is more adaptive in organisational contexts. Austenfeld and Stanton also discuss the time-course of emotional-approach. They argue that prolonged processing of information concerning a stressor without some form of emotional expression can be maladaptive. Therefore, consistent use of emotionally-expressive coping across situations might be adaptive, because there is regular processing and expression of

relevant emotions. Austenfeld and Stanton also argue emotional-approach allows adverse cognitive and physiological reactions to a stressor to diminish over time (cf. John & Gross, 2004), indicating emotional-approach could have a delayed effect.

Hypothesis 4a: Consistent use of emotional-approach coping enacted by control is associated with higher levels of well-being and fewer risky decisions.

Hypothesis 4b: Episodic emotional-approach coping enacted by control is associated with subsequently higher levels of well-being and fewer risky decisions.

Methods

Design

We chose an experience sampling methodology (ESM). Participants were asked to complete assessments of coping in the previous hour four times per day on personal digital assistants (PDAs) for five working days. Using PDAs and hourly assessments provides greater accuracy in assessments than can be obtained by retrospective reports over longer periods (Bolger, Davis & Rafaeli, 2003).

ESM allows investigation of cross-situational consistency in coping and episodic coping, and whether episodic coping has immediate or delayed effects. Cross-situational consistency can be examined by taking weekly averages of coping and relating these to measures of well-being and risky decisions. Immediate effects can be investigated by examining relationships between hourly measures of coping and measures of the dependent variables taken concurrently. By examining relationships between coping and indicators of the dependent variables at the next measurement occasion, ESM also allows investigation of delayed effects.

Sample & procedure

The sample was 32 design engineers working on a single project for a nuclear processing facility. We chose this sample because of the safety critical nature of the work. All designers belonged to the same organisation, volunteered for the study and comprised around 68% of the designers working on the project at that time. Twenty-nine of the sample were male, 13 of the sample belonged to the modal age category of 41 to 50 (the age range for entire sample was 20-60), 19 were educated to at least degree-level and all but one listed their ethnicity as 'White British'. On average, members of the sample have been working in their current job, firm and industry for 7.4 (sd=10.8), 4.0 (sd=6.9) and 15.4 (sd=11.2) years respectively.

On the Friday preceding the period of the ESM, participants completed a questionnaire to assess some control variables. The PDAs were distributed to participants on the first day of the ESM period (a Monday). The PDAs administered brief questionnaires four times daily over the course of one working week (Monday-Friday at 10.00, 12.00, 14.00 and 16.00). An alarm on the PDAs signalled when the questionnaire was to be completed. The sample provided complete data on 456 occasions out of a possible 599 (after taking into account known instances of absence etc). The overall compliance rate was 76% (individual ranges 26%-100%). The average number of responses was 14.3 (range 5 to 19 responses). Each individual's own compliance rate was controlled in the analyses.

Background questionnaire measures

Trait affect. As major control variables, we assessed the two main dimensions of trait affect (Watson & Tellegen, 1985): negative affect (NA) and positive affect (PA). NA relates to unpleasant, high activation affects such as anxiety. PA relates to pleasant, high activation affects such as enthusiasm. As well as trait predictors of well-being, there is evidence that trait affect influences cognitive processes (Wallace & Chen, 2005), and so may influence decision making. Trait affect was assessed by summing 10 items each for the emotional stability and

extraversion markers from the International Personality Item Pool (Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger & Eber, 2006). Extraversion and neuroticism - emotional stability's inverse – are indicators of trait PA and NA (Schaubroeck & Ganster, 1991). Items included 'I am relaxed most of the time' and 'I am the life of the party'. Participants were asked the extent to which each statement described them accurately on a five-point fully anchored scale (1='Very inaccurate', 5='Very accurate'). High scores indicate extraversion or emotional stability.

PDA measures

Problem-solving demands were assessed by the question 'In the past hour, how many issues without an obvious answer or solution have you had to deal with?', rated on a six-point scale (0,1,2,3,4,5 or more, see Daniels, Hartley & Travers, 2006).

Coping was assessed by asking participants to rate how they had coped in the past hour with the level of problem-solving demands they had experienced. Ratings were made on a six-point fully anchored-scale (1='Not at all', 6='To a large extent'). Two items were used to assess each form of coping. The items were derived from measures used previously (Daniels & Harris, 2005), and, for each coping function, reflect either aspects of executing control (Breugh, 1985) or eliciting support (House, 1981). Scale scores were calculated by summing item scores and dividing by two. If a participant reported experiencing no problem-solving demands for a given hour, the coping items were not presented, and participants automatically given scores of 1 ('Not at all') for all coping items.

The items were:

Problem-focused coping enacted by control: 'In the past hour, did you change your work objectives for the hour to solve the issues?' and 'In the past hour, did you change the order in which you normally do work tasks to solve the issues?'

Problem-focused coping enacted through support: ‘In the past hour, did you discuss the issues to help you solve them?’ and ‘In the past hour, did you ask for other people's views to help solve the issues?’.

Emotional-approach enacted by control: ‘In the past hour, did you change your work objectives for the hour to get your emotions off your chest?’ and ‘In the past hour, did you change the order in which you normally do work tasks to get your emotions off your chest?’.

Emotional-approach enacted through support: ‘In the past hour, did you talk to people at work about the issues to get your emotions off your chest?’ and ‘In the past hour, did you confide in other people about the issues to get your emotions off your chest?’.

To ensure the validity of separating problem-focused coping enacted by control from that enacted through support, and also emotional-approach coping enacted by control from that enacted through support, confirmatory factor analysis (CFA) was used to assess two models. The first was a two-factor model in which all problem-focused coping items loaded on one factor, and all emotional-approach items on another. The second model was a four-factor model differentiating problem-focused and emotional-approach coping enacted by control from these forms of coping enacted through support. In both models, factors were allowed to correlate. Robust methods were used, as these are suitable for data with non-independent observations, such as found where people are tracked over time in ESM studies (Satorra & Bentler, 1994). The four-factor model provided a better fit than the two-factor model (four-factor model: $\chi^2=18.70$, $df=14$, $p>.10$, $NFI=0.98$, $RMSEA=0.03$; two-factor model: $\chi^2=159.59$, $df=19$, $p<.001$, $NFI=0.84$, $RMSEA=0.13$).

Well-being. We took assessments of different components of psychological well-being that vary over the course of a working day. Affect is central to psychological well-being (Daniels, 2000), and so we assessed the two major dimensions of NA and PA (Watson & Tellegen, 1985). We also assessed fatigue as another component of affective well-being

(Daniels, 2000). Our final component of well-being was cognitive functioning. Symptoms of psychological ill-health include poorly functioning cognitive processes (Bebbington, 2004), including failures of memory, attention and action (Wallace & Chen, 2005).

Affect and fatigue were assessed by asking participants how they felt at that moment in time, using indicators validated in work contexts (Daniels, 2000). NA was assessed with the items 'anxious' and 'worried'; PA by 'motivated' and 'enthusiastic'; and fatigue by 'fatigued' and 'tired'. Cognitive functioning was assessed by three items reflecting the major domains of cognitive error: errors of memory, attention and action (Wallace & Chen, 2005). We adapted items from Wallace and Chen's work-specific measure, and asked participants to rate their cognitive error over the previous hour (e.g. 'In the past hour, have you been easily distracted from your work?'). A five-point scale was used for affect and cognitive error items (1='Not at all', 5='Very'), and scores calculated by summing item ratings and dividing by the number of items in the scale.

Risky decisions were assessed by four items tapping the use of risky protocols in design work. Risky design protocols, whilst not necessarily unsafe in themselves, do carry potential risk during fabrication and use (Sharit, 1998). These protocols were chosen by analysis of interviews with hazardous industry designers (n=11) and representatives of firms that either build or use major installations in hazardous industries (n=4). Designers were asked to state whether they had used any of these protocols during the previous hour ('Yes'=1, 'No'=0). The items were 'In the past hour, have you made assumptions about missing pieces of data?', 'In the past hour, have you reused a previous design that has not been updated?', 'In the past hour, have you applied solutions that have worked well in the past?' and 'In the past hour, have you added a design feature fit-for-purpose, but others need to decide if it's correct?'. Whilst these items do not indicate risk in themselves, they do indicate assumptions about how the design will operate. It is the potential non-alignment of

assumptions with actual operations that increases the risk of accidents (Busby, 2003). Self-reports of safety-relevant acts have been used previously in research on job design (Parker et al., 2001; Elfering et al., 2006). In this instance, self-reports are desirable because the decisions are cognitive and not observable directly by external observers. Also, there is the added benefit of recall of risky decisions over the previous hour. The neutral wording of the items minimised socially desirable responses (cf. Parker et al., 2001). Responses were summed and divided by four.

Weekly averaged measures

Weekly averages for each participant were computed for assessments of demands and coping. These assessments, reflecting differences between people, were then used in the analyses to assess relationships between the dependent measures and cross-situational consistency in coping, controlling for weekly averaged levels of demands (cf. Chan, 1998).

Analysis

We used multilevel regression analysis to analyse the data. This is appropriate for data from individuals tracked over time. Three sets of analyses were performed.

H1, H2, H3a, H3b and H4a all concern relationships between consistent use of a coping strategy. Therefore, in the first set of analyses, weekly averaged levels of coping were regressed onto each dependent variable. In these analyses, weekly averaged levels were analysed as an individual-level construct reflecting the individual-level nature of the hypotheses. Analyses controlled for day of week, time of day, average levels of demands over the week, compliance rate and trait affect. Day of week and time of day were coded as a series of dummy variables. Dummy variables were left in their raw metric and all other

variables centred at the mean for the sample (Raudenbush & Bryk, 2002, provide details on centering).

H3a and H3b also relate to episodic coping. In the second set of analyses, relationships between dependent variables and concurrent episodic coping were investigated, with coping analysed at the level of the episode to be consistent with some aspects of H3a and H3b. To control for use of multiple coping strategies in any one episode, all coping variables were entered into equations rather than just emotional-approach enacted through support. Since the first set of analyses examined differences in cross-situational consistency of emotional-approach enacted through support, it was important in these analyses to analyse the effects relating to specific episodes, uncontaminated by between-person effects in cross-situational consistency. This was to ensure the analyses assessed pure episodic rather than cross-situational effects. One way of separating out the effects of cross-situational consistency in coping from the effects relating to specific episodes is to subtract the mean for each person from the raw score to centre the independent variables at the person's mean (Kenny, Bolger & Kashy, 2002).¹ Therefore, coping variables were centred at each participant's mean for the ESM period to assess episodic coping independent of cross-situational consistency in coping. Analyses controlled for levels of the dependent variable at the immediately preceding time point on the same day (centred at the overall mean for the sample), along with demands assessed at the same time as coping (centred at each participant's mean for the week), dummy variables representing day of week and time of day (left in their raw metrics), compliance rate and trait affect (all centred at the overall sample mean). Because the use of lagged dependent variables meant that coping from the first observation of every day could not be used and because missing data on preceding occasions prevented an observation being used, only 299 observations from all 32 participants could be used in these analyses.

¹ In most applications of multilevel regression analysis in organisational research, this is known as group-mean centering (Hofmann & Gavin, 1998), because most applications concern persons nested within groups.

H3a and H3b leave open the possibility of relationships between episodic emotional-approach enacted through support and subsequent indicators of well-being and risky decisions. H4b explicitly states that episodic emotional-approach enacted by control has delayed effects. In the third set of analyses, relationships were assessed between coping (centered at the person's mean for the ESM period and analysed at the level of the episode) and levels of dependent variables at the time point immediately succeeding and on the same day as the assessment of coping. Again, to assess episodic coping, measures of coping were centred at each participant's mean along with demands assessed at the same point as coping. All coping variables were entered into equations to control for use of multiple coping strategies. Levels of the dependent variable assessed at the same time as coping were also controlled (centred at the overall mean for the sample), along with controls for day of week, time of day, compliance rate and trait affect (centred as before). Some 299 observations from all 32 participants were also used in these analyses.

We took an incremental approach to model building (Snijders & Bosker, 1999). At the first step, the control variables of time of day, day of week, compliance rate and trait affect were regressed on the dependent variable. Next, for the second and third analyses only, lagged levels of the dependent variable were entered. At the final step, demands and the coping variables were entered. At each step, regression slopes for the variables entered were allowed to vary between people. If a regression slope evinced no significant variation between people ($p \geq .50$) then the slope was fixed to be invariant across participants. The step was run again to examine for further variation in slopes. This process was repeated until only slopes with evidence of variation were left to vary between people in the equation at that step ($p < .50$). Once this point was reached, we proceeded to the next step.

Robust standard errors were used to estimate test statistics because all substantive variables, excepting momentary PA, were positively skewed ($p < .0001$), and all variables

excepting demands were either leptokurtic or platykurtic ($p < .05$). Multilevel Poisson regression was used for analyses involving intentional use of risky decision protocols, since this variable consisted of count data and was positively skewed (Snijders & Bosker, 1999). The population-average model is reported for Poisson regressions, since this form of analysis attempts to generalise beyond this study's sample. One-tailed tests were used for H1, H2, H4a and H4b, two-tailed tests for H3a, H3b and all other relationships.

Results

INSERT TABLE 2 HERE

Table 2 shows means, standard deviations, reliabilities and correlations for the questionnaire and ESM variables. The means for the emotional-approach variables are lower than for the problem-focused coping variables and near the theoretical minimum. We do not consider this problematic for two reasons. First, given the frequency of questioning, the limited time-frame of one hour and norms concerning emotional expression in workplaces (Ashforth & Humphrey, 1995), then a low rate of emotional-approach might be expected. Second, investigation of the range of the coping variables indicates emotional-approach enacted by control neared the theoretical maximum (5.50) and emotional-approach enacted through support reached the theoretical maximum (6.00). Intra-class correlations for the coping variables (not shown in table 2) indicate that there are discernible consistencies in how people cope across situations, indicative of differences in cross-situational consistency in coping (0.26 for problem-focused enacted by control; 0.28 for problem-focused enacted through support; 0.51 for emotional-approach enacted by control; 0.47 for emotional-approach enacted through control).

INSERT TABLES 3, 4 AND 5 HERE

Table 3 shows regressions for weekly averaged assessments of coping. Since weekly averaged measures are indicators of consistent use of coping, these regressions provide tests of H1-H4a. Higher weekly averaged problem-focused coping enacted by control was associated with lower levels of momentary NA ($B = -.55, p < .01$) and fewer reports of risky decisions ($B = -.56, p < .01$). Higher weekly averaged problem-focused coping enacted through support was associated with higher momentary levels of PA ($B = .43, p < .01$). These results provide partial support for H1 and H2. Emotional-approach enacted through support was related to lower levels of momentary PA ($B = -.83, p < .05$), providing partial support for H3b. There is no support for H3a in these analyses. Whilst higher weekly averaged emotional-approach coping enacted through control was related to higher momentary PA ($B = 1.15, p < .05$), it was also related to higher NA ($B = 1.06, p < .05$) and more reports of risky decisions ($B = 1.39, p < .05$). Therefore, overall, there is no support for H4a.

Table 4 shows the results for regression analyses with hourly variations from average levels of coping on dependent measures assessed at the same time. As indicators of episodic coping, these regressions with hourly variations from average levels of coping examine the immediate influence of episodic coping. Increases in emotional-approach enacted through support were associated with higher concurrent momentary NA ($B = .18, p < .01$) but fewer reports of risky decisions in the same hour ($B = -.19, p < .05$). These results provide mixed support for H3a and H3b. Other results in table 4 are noteworthy. Increases in problem-focused coping enacted by control were associated with high levels of momentary NA ($B = .09, p < .001$) and cognitive error ($B = .06, p < .05$). Increases in problem-focused coping enacted through support were associated with higher hourly reports of risky decisions ($B = .11, p < .01$). Emotional-approach coping enacted by control was associated with higher momentary fatigue ($B = .19, p < .01$).

Table 5 shows results for hourly variations from average levels of coping regressed onto subsequent levels of the dependent variables. These regressions examine the effects of episodic coping two hours after the coping episode. There was again a mixed pattern of results in respect of H3a and H3b. Whilst emotional-approach enacted through support was related to higher subsequent PA ($B = .14, p < .01$), it was also related to more risky decisions subsequently ($B = .20, p < .05$). There was partial support for H4b, in that emotional-approach coping enacted by control was related to subsequently less cognitive error ($B = -.21, p < .01$) and fewer risky decisions ($B = -.18, p < .05$).

Discussion

The results indicate that some aspects of well-being and decision-making benefit from consistent use of problem-focused coping enacted by control and support to cope with problem-solving demands. These results provide partial support for H1 and H2. In some instances, emotional-approach enacted through support is associated with better well-being and fewer risky decisions, in others it is associated with reduced well-being and more risky decisions. Thus, there is no overall support for either H3a or H3b. Consistent use of emotional-approach enacted by control across situations was more frequently associated with adverse outcomes, indicating no support for H4a. However, episodic use of emotional-approach enacted by control was associated with less subsequent error and fewer risky decisions, indicating support for H4b in relation to cognitive variables.

Problem-focused coping enacted by control (H1)

The results indicate that any beneficial effects of cross-situational consistency in problem-focused coping enacted by control in this sample are specific to NA and reductions in the number of risky design decisions. These two findings may be related. In a safety critical

environment such as nuclear design, an important performance goal may be to avoid risk. Such avoidance goals are more closely tied to NA than PA (Higgins, 1997), and so coping that enables designers to solve problems without taking risks may reduce NA. Support for this goal-based route comes from evidence that problem-focused coping enacted by control is associated with progress towards goals (Daniels & Harris, 2005).

There were unexpected findings concerning episodic problem-focused coping enacted by control and its relationships with NA and cognitive error. Individuals who typically engage in problem-focused coping enacted by control may have acquired the job knowledge and self-efficacy to implement this form of coping effectively (Clegg & Spencer, 2007). However, those that use this form of coping more occasionally may not yet have acquired the relevant knowledge and self-efficacy. Lack of knowledge may account the relationship with cognitive error as this form of coping may stretch individuals' cognitive resources. Lower levels of self-efficacy may account for the relationship with NA, as individuals may worry about the effectiveness of this form of coping for resolving problems. The finding that problem-focused coping enacted by control can be detrimental, if only in the short-term, helps to explain findings that indicate job control can be harmful (Daniels et al., 2004).

Problem-focused coping enacted through support (H2)

The beneficial effects of cross-situational consistency in problem-focused coping enacted through support were specific to PA. One explanation for this specificity is that PA is influenced by progress towards goals (Carver & Scheier, 1990). It may be that eliciting support provides the information or instrumental support that promotes personal goal progress (House, 1981). However, problem-focused coping enacted through support may influence affective well-being directly, not necessarily via goal progress (Daniels & Harris, 2005). For many people, the experience of receiving help to solve problems may be so

commonplace, that there are direct associations between this form of coping and PA that operate independently of goal-based processes (Daniels et al., 2004).

Although not hypothesised, temporary increases in problem-focused coping enacted through support were associated with short-term increases in the number of risky decisions. These results may reflect the support networks of people who are able to seek advice more often than those who are not, and hence the quality of support. Because of the reciprocal nature of support, experts may support experts, providing each other with good advice (cf. Van der Vegt, Budnerson & Oosterhof, 2006). Moreover, those that are able to elicit support consistently to help solve work problems may have well-developed networks in which there is the potential to delay reciprocation until physical or cognitive resources are at suitable levels (cf. Schönplflug & Battmann, 1988). In contrast, those who may elicit support only occasionally may not receive the same level of support from experts because: expert donors perceive an inability to obtain reciprocal support (Van der Vegt et al., 2006); recipients perceive they are unable to reciprocate higher levels of support to experts, so do not seek such support from them (cf. House, 1981); or recipients may lack knowledge concerning the right kinds of questions to ask or people from whom to seek support.

Emotional-approach coping enacted through support (H3a and H3b)

The mixed pattern of results for emotional-approach enacted through support suggests that detrimental effects might cancel any benefits. Although expressing emotions about a stressor to others could be beneficial (Austenfeld & Stanton, 2004; Clark & Finkel, 2004; House, 1981), there may be costs to seeking such support because of departures from organisational norms. A more general point from the mixed pattern of relationships with emotional-approach enacted through support is that the results highlight that there are circumstances in

which support is harmful for well-being and cognitive functioning. Therefore, the results help to explain findings that support can accentuate the effects of stressors (Daniels et al., 2004).

Emotional-approach coping enacted by control (H4a and H4b)

Cross-situational consistency in emotional-approach enacted by control was linked to higher PA. However, it was also associated with higher levels of NA and risky decisions. These results may reflect the balance of costs and benefits of this form of coping. Changing work patterns to regulate affect, rather than tackling work problems directly, removes individuals from performing their work tasks. Whilst this may be somewhat protective of some forms of well-being, it may mean less time is devoted to checking, in the context of this sample, the risks to safety embedded in a design. Therefore, risky design decisions may be made in order to meet other work requirements (such as completing work to schedule). In this case, the goal of avoiding risky decisions has failed, so leading to higher NA (Higgins, 1997). These results help provide another explanation for findings that control can be harmful (Daniels et al., 2004).

In contrast to consistent use of emotional-approach enacted by control, engaging in this form of coping occasionally may not remove the individual from on-task requirements for too long. Indeed, episodic emotional-approach enacted by control was associated with less cognitive error and fewer risky decisions. Whilst episodic emotional-approach coping was associated with concurrent fatigue, the effects did not appear to last over time. Individuals that do not use job control to take breaks from problem-solving demands may suppress feelings of fatigue as information processing is directed toward problem-solving demands. Those that do take breaks or engage in other activities may initially feel more fatigue as these feelings are no longer suppressed. However, over time, emotional-approach enacted by control may allow individuals to replenish cognitive resources (Beal et al., 2005), thus

providing an explanation for the specific effects of this episodic form of coping on the cognitive variables of error and risky decisions. However, taking into account the results concerning cross-situational consistency in the use of emotional-approach enacted by control, there is a balance between short-term cognitive benefits from temporary use of this form of coping and the potential cognitive costs of consistent use of this form of coping in some jobs.

Limitations

There are limitations of the current research. First, although typical of many organisational experience-sampling studies, a sample of 32 was assessed for just one week. These restrictions could mean a reduction in statistical power. Two factors mitigate against this. First, the signs of relationships in tables 3-5 do not indicate a uniform trend for each coping variable, indicating non-significant results are not the product of reduced power. Second, the increased measurement precision of taking hourly assessments of the dependent and independent variables four times a day (e.g. Todd, Tennen, Carney, Armeli, & Affleck, 2004) serves to reduce loss of power due to random error in measurement.

Since we did not assess the presence of control or support in the manner usually employed in organisational research (Daniels, 2006), then we were not able to compare the explanatory power of coping behaviour/function combinations in respect of the DCSM with that of other models that hypothesise other processes as explanations of the benefits of control and support (e.g. Warr, 1987). It would also seem appropriate to investigate further the different forms of emotional-approach coping: the present results highlight inconsistencies in effectiveness that need further attention. There remains scope to investigate a wider range of coping behaviour/function combinations. For example, we have not investigated coping strategies such as emotional-suppression, avoidance or re-appraisal (see e.g. Skinner et al., 2003), nor have we investigated other job characteristics that may be

enacted to fulfil coping functions (e.g. a worker may choose to stick rigidly to a job description, as an example of role clarity, in order to avoid solving problems, cf. Griffin et al., 2007).

Conclusions and implications

Although no single hypothesis was supported across the range of dependent variables, there were a sufficient number of statistically reliable relationships evident to offer general conclusions. Whilst the findings relate specifically to aspects of health and risky decisions at work and, theoretically, to the DCSM, these conclusions can be applied more generally.

The results indicate the dependent variables are associated in different ways with the four forms of coping assessed in this study. This indicates the importance of differentiating coping behaviours (e.g. execution of control versus elicitation of support) and linking them to specific coping functions (e.g. problem-focused, emotional-approach). Our approach to measuring coping behaviour/function combinations enabled such differentiation. Whilst this approach stays close to the theoretical premises of the DCSM, there are implications for the measurement of coping more generally in organisational research.

Along with other research (Clegg & Spencer, 2007; Noon & Blyton, 1997; Wrzesniewski & Dutton, 2001), the results indicate that workers are active in shaping their jobs. An important addition to the literature is that the present results indicate the influence of job characteristics on the experience of work and performance is not simply due to activity, but also dependent upon the purposes for which a job characteristic is enacted. Proactive problem-solving is thought of as one example of proactivity at work and has been linked to job autonomy and aspects of workers' social environment (Parker, Williams & Turner, 2006). One implication of the present study is that job characteristics such as autonomy can be implemented for, what might be considered to be, non-proactive purposes such as emotional-

approach coping. Practically then, attempts to foster proactive behaviour by enhancing job autonomy may produce unintended consequences. Specifically in relation to the DCSM, the results indicate that the purpose of enacting job-control for emotional-approach could usefully be incorporated into the model.

The results indicate that the purposes for which job characteristics are enacted can influence important organisational phenomena. In this study, these phenomena were well-being and risks to safety, which tend to emphasise the avoidance of risk. Moreover, the sample was chosen because of presumed risk aversion. In other contexts, risk may be seen as desirable, for example, where innovation is important. Therefore, whilst it may be important to examine contexts in which the consequences of risk-taking are positive (Sitkin & Weingart, 1995), it may be concluded that the purposes for which control and support are used have implications for the ways in which workers act in the face of uncertain consequences from their actions.

A practical implication of this point is that the results do not simply suggest that interventions to improve job control and supportive interactions would be beneficial. Rather, the results indicate such interventions should be augmented by training to improve job knowledge and problem-solving skills, and knowledge management initiatives aimed at sharing knowledge of solving previously encountered problems. The danger of not taking into account the knowledge needed to execute problem-solving may mean that enhanced control or support might be used to solve work-problems sub-optimally, or instead used consistently and across situations for emotional-approach, which can also be harmful. However, the results also suggest some cognitive benefits from occasional use of emotional-approach enacted by control, suggesting job redesign interventions could benefit from training targeted at workers and their managers for this purpose (cf. Bond & Bunce, 2000).

The results indicate the importance of considering different temporal processes. For example, cross-situational consistency in problem-focused coping enacted by control was associated with some adaptive outcomes, but episodic deviations from cross-situational consistency associated with potentially detrimental outcomes. Not only do these results support the dynamic nature of the DCSM, but also indicate that job characteristics and related streams of research (e.g. work on how human resource management practices shape the experience of work, e.g. Van Dyne, Kossek & Lobel, 2007) would benefit from considering the impact of both cross-situational and episodic factors. Further exploration of such temporal processes may help to illuminate how work can contribute to virtuous circles of health and performance promotion (cf. Clegg & Spencer, 2007; Karasek & Theorell, 1990) or vicious circles of deterioration of well-being (Firth-Cozens, 1992).

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Table 1 Aspects of coping examined

Coping function	Problem-focused	Emotional-approach
Coping behaviour Temporal aspects		
Execution of control	Problem-focused coping enacted by control	Emotional-approach enacted by control
Consistent use	Cross-situational influence	Cross-situational influence
Episodic concurrent	Episodic - immediate influence	Episodic – immediate influence
Episodic delayed	Episodic – delayed influence	Episodic – delayed influence
Elicitation of support	Problem-focused coping enacted through support	Emotional-approach enacted through support
Consistent use	Cross-situational influence	Cross-situational influence
Episodic concurrent	Episodic – immediate influence	Episodic – immediate influence
Episodic delayed	Episodic – delayed influence	Episodic – delayed influence

Table 2 Means, standard deviations, reliabilities, and correlations

Variable	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Emotional stability	33.56	8.72	.92											
2. Extraversion	32.72	7.31	-.16	.88										
3. Demands	1.63	.88	.21	.10	--									
4. Control – problem-focused coping	2.11	.74	.18	.25	.60	.84								
5. Support – problem-focused coping	2.76	1.06	.01	.27	.66	.62	.92							
6. Control – emotional-approach coping	1.42	.67	.03	.21	.43	.54	.40	.90						
7. Support – emotional-approach coping	1.46	.70	.00	.25	.43	.45	.43	.83	.86					
8. Momentary NA	1.60	.63	-.25	.00	.26	.32	.24	.46	.42	.78				
9. Momentary PA	3.35	.75	.02	.07	.23	.19	.24	.11	.11	.07	.91			
10. Momentary fatigue	1.99	.60	-.16	.29	.05	.11	.04	.21	.17	.32	-.30	.88		
11. Cognitive error	1.55	.47	-.17	.29	.07	.28	.04	.46	.39	.29	-.16	.42	.69	
12. Risky decisions	.37	.19	.14	.35*	.36	.27	.39	.28	.27	.06	.13	-.05	.10	.68

n=32, no. observations = 456. * $p < .05$. Alpha coefficients of reliability are shown on the primary diagonal.

Variables 1-2 are person-level variables, variables 3-12 are episode-level variables. Reliabilities for episode-level variables are calculated from episode-level items rather than item averages across the week. Correlations between variables 1-2 and 3-12 are calculated on each participant's average values across the ESM period. Significance of correlations between variables 3-12 is not shown, since inference testing of correlations is inappropriate with repeated measures data.

Table 3 Multilevel regression with weekly averaged levels of coping.

	NA		PA		Fatigue		Error		Risky decisions†	
	B	SE	B	SE	B	SE	B	SE	B	SE
Control – problem-focused coping	-.55**	.18	-.45	.27	.02	.27	.23	.12	-.56**	.21
Support – problem-focused coping	-.09	.09	.43**	.16	-.07	.14	-.04	.04	.20	.10
Control – emotional-approach coping	1.06*	.49	1.15*	.57	.18	.70	.44	.30	1.39*	.58
Support – emotional-approach coping	-.40	.43	-.83*	.44	.08	.59	.08	.26	-.95	.49
Variance components	VC		VC		VC		VC		VC	
Intercept	.21***		1.42***		1.09***		.07**		.01	

n=32, no. observations = 456. Coping variables are aggregated at the person-level of analysis (n=32)

*p < .05, ** p < .01, *** p<.001. Analyses reported also control for demands, emotional stability, extraversion, day of week, time of day and compliance rate. Full details available on request.

† B and SE are for population average model. Population average model does not compute variance components, therefore unit-specific values are used for variance components.

Table 4 Multilevel regression with hourly levels of coping on concurrent dependent variables.

	NA		PA		Fatigue		Error		Risky decisions†	
	B	SE	B	SE	B	SE	B	SE	B	SE
Control – problem-focused coping	.09**	.03	-.01	.04	-.02	.04	.06*	.02	.04	.04
Support – problem-focused coping	.01	.03	-.02	.03	.03	.03	-.02	.02	.11**	.04
Control – emotional-approach coping	.12	.07	-.13	.14	.19**	.06	.07	.08	.08	.10
Support – emotional-approach coping	.18**	.06	.03	.09	-.12	.07	-.05	.05	-.19*	.08
Variance components	VC		VC		VC		VC		VC	
Intercept	.22***		.31***		.26***		.30***		.00	
Control – problem-focused coping	Fixed		Fixed		.02*		.01***		Fixed	
Support – problem-focused coping	Fixed		Fixed		.01		Fixed		Fixed	
Control – emotional-approach coping	Fixed		Fixed		Fixed		.07***		Fixed	
Support – emotional-approach coping	Fixed		Fixed		.05*		.02***		Fixed	

n=32, no. observations = 299. Coping variables are analysed at the level of each observation (n=299)

*p < .05, ** p < .01, *** p < .001. Analyses reported also control for demands, emotional stability, extraversion, day of week, time of day, values of the lagged dependent variable and compliance rate. Full details available on request.

† B and SE are for population average model. Population average model does not compute variance components, therefore unit-specific values are used for variance components.

Table 5 Multilevel regression with hourly levels of coping on subsequent dependent variables.

	NA		PA		Fatigue		Error		Risky decisions†	
	B	SE	B	SE	B	SE	B	SE	B	SE
Control – problem-focused coping	.00	.02	-.01	.02	-.01	.03	.00	.04	.01	.04
Support – problem-focused coping	.03	.02	-.02	.03	.05	.03	-.01	.02	-.06	.05
Control – emotional-approach coping	.01	.10	.01	.08	-.19	.14	-.21**	.08	-.18*	.10
Support – emotional-approach coping	-.06	.06	.14**	.05	.01	.05	.03	.05	.20*	.08
Variance components	VC		VC		VC		VC		VC	
Intercept	.12***		.92***		.23***		.21***		.00	
Control – problem-focused coping	.01*		Fixed		Fixed		Fixed		Fixed	
Support – problem-focused coping	Fixed		Fixed		Fixed		Fixed		Fixed	
Control – emotional-approach coping	.09**		Fixed		Fixed		Fixed		Fixed	
Support – emotional-approach coping	Fixed		Fixed		Fixed		.02*		Fixed	

n=32, no. observations = 299. Coping variables are analysed at the level of each observation (n=299)

*p < .05, ** p < .01, *** p < .001. Analyses reported also control for demands, emotional stability, extraversion, day of week, time of day values of the lagged dependent variable and compliance rate. Full details available on request.

† B and SE are for population average model. Population average model does not compute variance components, therefore unit-specific values are used for variance components.