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When things go wrong: The effect of daily work hassles on effort, exertion and negative mood

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This paper discusses the effect of occupational hassles on negative mood and effort exertion. Expert ratings were used to measure the predictor variables, assignment complexity and hassles severity, whereas the dependent variables were measured with validated self-report scales. Using pooled-time series analysis on daily records of a sample of military jump masters (parachute trainers), it was shown that hassles severity predicted end-of-day mood, fatigue and subjective workload. This indicates that, despite their transient nature, daily hassles at work constitute a significant factor whose effect has been overlooked by available methods of occupational stress. Furthermore, the interaction between assignment complexity and hassles severity suggests that other variables, such as coping options for dealing with hassles, moderate the effect of hassles on behavioural and emotional outcomes. Since this effect can be explained by means of different theoretical constructs (i.e. effort exertion, cognitive appraisal and rate of progress) this poses a challenge for future research, both theoretical and applied.

This paper examines the effect of externally induced obstacles which disrupt goal-directed behaviour (see review of goal constructs by Austin & Vancouver, 1996). In the context of work, such obstacles may be: equipment malfunction, unscheduled change of task assignments, information difficulties or inappropriate behaviour of co-workers. Studies of people in various occupations have indicated that such obstacles are encountered daily (Johansson & Aronsson, 1984; Minzberg, 1975; Zohar, 1997). In the stress research literature they are identified as hassles, or annoying episodes in which daily tasks become more difficult or demanding than anticipated, i.e. when negative feedback is encountered (Kanner, Coyne, Schaefer & Lazarus, 1981). Despite the fact that hassles' level predicts stress symptoms better than most other predictor variables (Kanner *et al.*, 1981; Kohn, Lafrenier & Gurevich, 1990; Lazarus, 1990; Stone & Neale, 1982; Zohar, 1997), current models of occupational stress typically ignore obstacles or hassles as a source of stress. Instead, these models employ person–environment discrepancy as the core construct, using high-order meta-goals as person variables (e.g. maintaining

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self-esteem, satisfying need of achievement), and global job attributes as environment variables (e.g. role conflict, role ambiguity, role overload and limited decision latitude; see French, Caplan & Harrison, 1982; Kahn & Byosiere, 1991; Karasek & Theorell, 1990). This means that, while the major models are variants of cybernetic control theory (Edwards, 1992), they refer only to the uppermost feedback loops, i.e. the level of *self* in the hierarchy of feedback control (Carver & Scheier, 1981; Kluger & DeNisi, 1996). However, attention is normally directed to middle levels of the hierarchy which are associated with regulation of behaviour with reference to focal tasks and temporary, or short-term, goals. Although meta-goals are linked with focal goals in a top-down fashion, people tend to focus most of the time on immediate goals (Carver & Scheier, 1981; Kluger & DeNisi, 1996; Vallacher & Wegner, 1987; Wicklund, 1975). This means that people attend mostly to daily tasks whose successful completion is expected to serve long-term career goals or enhance professional self-esteem. Thus, to better understand occupational stress, theoretical and methodological approaches appropriate to the middle level of analysis are needed, in addition to the available models for the uppermost level. This means that the study of task-related obstacles, or daily hassles at work, can enhance our understanding of this phenomenon. Given the paucity of research in this direction, the present paper offers additional relevant data.

Theoretical framework for the study of occupational hassles

The most elaborate theoretical discussion of goal-barriers and their effect on the pursuity of current goals appears in action theory, developed mainly in Germany (see review by Frese & Zapf, 1994). Action theory considers the disruptive effect of goal-barriers in terms of ensuing behaviour regulation problems (Frese & Zapf, 1994; Greiner & Leitner, 1989; Semmer, 1982) which arise when on-going activity is interrupted by external factors for which there is no immediate solution, hence behaviour cannot be continued as planned. The individual must then invest additional effort and develop new action plans. Effort expenditure, according to this theory, includes both the mental effort of problem solving and decision making, and physical effort when increased speed or force are required to compensate for regulation problems. This emphasis on effort as key behavioural parameter is corroborated in goal-setting and social cognition research, indicating that the dominant strategy in response to negative feedback is effort exertion, especially when commitment is maintained and goal attainment is considered feasible (see reviews in Bandura, 1986, 1991; Latham & Locke, 1991; Locke & Latham, 1990). As noted by Schonpflug (1986*a*), effort expenditure is especially critical in the context of psychological stress, since energy resources are rapidly consumed. They must, therefore, be quickly replenished, and delay can become a crucial issue and a potential source of stress (see also other models of behaviour regulation with effort as key parameter: Gopher & Sanders, 1984; Kahneman, 1973; Mulder, 1986; Pribram & McGuinness, 1975; Svebak, 1991). By contrast, structural resources such as personal skills, social support or technical aids do not require replenishment, and pose few regulation problems, thus having little relevance to the onset of stress. Loss or depletion of critical resources as a proximal factor in psychological stress has also been suggested in other theoretical models (Eysenck, 1983; Fisher, 1986; Hobfoll, 1988, 1989). Of special relevance here is the adaptive-cost hypothesis (Cohen, 1980; Glass & Singer, 1972; Selye, 1956), emphasizing biological and psychological after-effects of coping with a stressor, including performance decrements, reduced interpersonal tolerance and negative mood.

The behaviour economics model (Schonpflug, 1983, 1985, 1986*a*, 1986*b*; Schonpflug & Battmann, 1988) discusses side-effects and after-effects of effort expenditure, referring to them as operational costs of coping. Since energetic supplies are limited, expenditure during coping with obstacles creates temporary loss of resources so that fewer resources are available for pursuing the primary task. Side-effects will therefore include increased fatigure and negative mood. After hassles are successfully dealt with, and progress on the primary task is resumed, hassles still exert after-effects until such time as the person has a chance to recovery by resting or relaxation (Schonpflug & Battmann, 1988). This situation will deteriorate further if coping attempts are not completely successful so that progress towards the goal remains costly in terms of energetic resources. The effect of obstacles on energy expenditure and associated stress is thus magnified, since the cost of continued coping outweighs benefits, making coping itself an additional source of stress (see the description of behaviour economics in Schonpflug & Battmann, 1988).

Obstacles, as barriers between person and goal, fit also the definition of hassles as episodes of disrupted goal-directed behaviour (see review of the hassles construct by Lazarus, 1990). That is, they are certain types of task-related hassles. Therefore, theoretical discussion of hassles can be applied to the research on disruption or obstacles. The theoretical model of hassles as a stress factor employs cognitive appraisal as the key explanatory variable (Lazarus, 1990). According to cognitive appraisal theory, specific appraisal patterns result in negative emotions such as anxiety or depression. For example, anxiety arises when an event is appraised as motivationally relevant (i.e. affecting an important goal), motivationally incongruent (i.e. disrupting goal achievement), and when the situation is of low or uncertain coping potential (see review of cognitive emotion theory by Lazarus, 1991). Hassles fall into this category since if they would not have been motivationally incongruent and if they would have offered acceptable coping options, they would not have been classified as hassles. Cognitive appraisal theory predicts, therefore, that hassles are followed by negative mood in proportion to the hassle's appraised disruptiveness or severity. The effect of hassles on mood was demonstrated, for example, by Williams & Alliger (1994) who investigated the effect of disruptive family–work role intrusions on daily mood. Examples of such intrusions include dealing with spousal problems during work, or with work-related problems while at home. Using pooled-time series analysis (Sayrs, 1989), it was shown that negative mood increased significantly as a result of such intrusions. According to the theoretical framework of hassles research, over time the cumulative effect of hassles results in the development of physical and psychological symptoms of stress (Burks & Martin, 1983; DeLongis, Folkman & Lazarus, 1988; Eckenrode, 1984; Kanner *et al*., 1981; Monroe, 1983; Pillow, Zautra & Sandler, 1996; Weinberger, Hiner & Tierney, 1987).

A recent study by Zohar (1997) tested the hassles concept in the context of work, by transposing the three major occupational stress categories (i.e. role conflict, role ambiguity and role overload) to a middle level of analysis. Role conflict, for example, was represented through various hassle types associated with conflicting expectations at work. Using a sample of hospital nurses, it was shown that hassles' severity provided incremental prediction of burnout symptoms beyond that offered by available role stress scales. Since the primary symptoms of burnout are physical and mental exhaustion (Maslach & Jackson, 1986), these findings support the concept of effort exertion as a key factor in response to obstacles during goal-directed episodes. In another study, Motowidlo, Packard & Manning (1986) used a list of 45 disruptive events associated with hospital nursing. As with other hassle scales, frequency and severity ratings were used. Both scores predicted symptoms of anxiety and depression, supporting the hypothesized effect of hassles on negative emotion. Similar results were reported by Koch, Tung, Gmelch & Swent (1982), using a hassles checklist for school administrators as the predictor variable, and emotional reaction as dependent variable.

Another theoretical model adopts rate of progress as the key explanatory variable for negative mood is response to obstacles between person and goal. As noted in several literature reviews, there is ample support for the premise that progress towards short-term and longer-term personal goals affects emotional reaction (Emmons, 1986, 1991; Little, 1989; Omodei & Wearing, 1990). Carver & Scheier (1990) postulated an additional superordinate feedback loop in their model of cybernetic control, which senses and regulates the *rate* at which the distance to a goal is being diminished. The main hypothesis in this regard is that positive or negative mood is directly affected by the rate of discrepancy reduction (i.e. rate of progress, compared with the anticipated rate). In other words, it is not merely the size of discrepancy, but its reduction as a function of time, which affects emotional reaction. Since obstacles result in a slower progress than expected, they induce negative mood regardless of the level of effort exerted to cope with disruption. A recent study of progress in goal achievement revealed a significant correlation between progress and a composite measure of emotional well-being (Brunstein, 1993). In addition, progress at time n predicted residualized well-being at time n + 1. Even more interesting from our perspective is the fact that *change* of rate of progress was a significant predictor of residualized mood at the end of the recording period. Change of rate of progress is, of course, directly attributable to obstacles. In other words, obstacles can be expected to result in negative mood since they decrease the rate of progress towards a focal goal.

In summary, the theoretical review suggests that obstacles will result in negative mood and effort exertion, with the latter indicated by reported fatigue and overload. This is summarized in Fig. 1, which presents a control model concerning the effect of obstacles on goal-directed behaviour and associated consequences. According to this model, discrepancy between focal goal and current situation, as identified by a comparator element, results in mediated and unmediated effect on negative mood. The unmediated link is based on Lazarus' cognitive appraisal theory, and on Carver

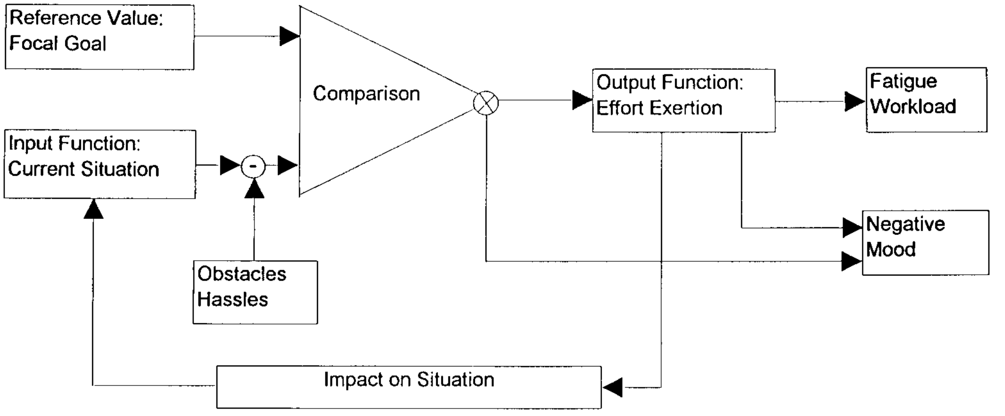

Figure 1. A cybernetic model of the effect of hassles on behavioural and emotional outcomes.

& Scheier's control theory of emotion. The mediated link is based on German action theory, especially Schonpflug's behaviour economics version of that theory. According to the latter, depletion of vital energetic resources accounts for negative mood, in addition to accounting for onset of fatigue and subjective overload. It should be noted, therefore, that whereas fatigue and overload are predicted uniquely by behaviour economics, negative mood is predicted by all three theoretical models. The present study was not designed to test alternative explanatory variables (i.e. effort exertion, cognitive appraisal and rate of progress) for negative mood, even though this should be done in the future in order to better understand the effect of obstacles on emotional reaction. Rather, given the paucity of data on the effect of obstacles (or hassles) during work, the present study combines non-contradictory predictions of the three models in order to test the magnitude of these effects, before more elaborate tests are attempted. Complementary predictions of these models are summarized with the following hypotheses:

Hypothesis 1. Hassles encountered during focal task execution result in elevated negative mood in proportion to hassles' severity.

Hypothesis 2. Hassles encountered during focal task execution result in elevated subjective workload and fatigue in proportion to hassles' severity.

The relationship between hassles and mood and fatigue is likely to be influenced by focal task's complexity, serving as covariate and a moderator. Complexity, according to action theory, refers to the level of behaviour regulation required to perform a particular task (Frese, 1987; Frese & Zapf, 1994). In some ways, this concept is similar to qualitative workload (French *et al.*, 1982), since it reflects the number of goals, plans and feedback signals to be regulated simultaneously when performing a task, as well as the conditional relationships among these elements. Hence, it identifies the intricacy of the regulatory process in the context of goal-directed behaviour. Certain tasks are highly complex since they require multiple decisions as a situation develops, whereas others, in which decision possibilities are limited, allow little complexity. Complex tasks take more mental effort to regulate, hence they should result in higher subjective workload and fatigue. This was demonstrated, for example, by Kirmeyer (1988) who tested the effect of regulation complexity on effort expenditure using a sample of police radio dispatchers. Having to process simultaneously two radio messages, a situation of high task complexity, resulted in increased subjective workload after controlling for the effect of objective workload (i.e. the hourly rate of messages). In addition to their effect on effort exertion, complex tasks are also expected to result in a more negative mood, although the relationship is non-linear. Complexity as qualitative workload was shown to have a curvilinear relationship with negative emotion, too little complexity resulting in boredom and depressive mood, and too much complexity resulting in threat and anxiety (see review by French *et al.*, 1982). In effect, at either end of the continuum, complexity is likely to be accompanied by negative mood which must be considered when testing the effect of hassles on mood.

Task complexity can also act as moderator of the relationship between hassles and mood and fatigue. Since complex tasks require more mental effort, they leave fewer energy resources for coping with hassles. Based on the notions of limited energy resources and of operational costs of coping, it follows that hassles would be coped with less efficiently whenever they disrupt more complex tasks. This is based on the premise that fewer energetic resources are immediately available for coping with disruption when performing a complex task. Reduced coping efficiency would, in turn, increase the disruptive effect of hassles, by turning the actual coping process into an additional source on stress (Schonpflug & Battmann, 1988). This means that an interaction is expected between focal task's complexity and hassles' severity such that the effect of hassles on mood and fatigue is expected to increase the more complex the disrupted task. This argument is summarized with the following hypothesis:

Hypothesis 3. The effect of hassles severity on negative mood, subjective workload and fatigue is moderated by complexity of the focal task which is being disrupted.

The present study employed a sample of military jump masters (parachute trainers) whose jobs covered a range of assignments of varying complexity, and non-correlaed sources of disruption or hassles. Of considerable methodological advantage in this case was the fact that both assignment complexity and hassles severity (i.e. the independent variables) were amenable to external measurement, helping to control common method effects which undermine most research in this field. In addition, the study employed repeated daily measures of the same participants over the course of one week, using pooled-time series analysis for testing the hypotheses. This method enabled the study of time-dependent phenomena while removing response bias as a source of error in self-report data (Sayrs, 1989; West & Hepworth, 1991). The statistical model included sleep loss as the control variable, in view of its potential effect on reported fatigue and workload, two of the dependent variables in this study (Bonnet, 1985; Krueger, 1989; Meijman, Vander Meer & Dormolen, 1993; Samkoff & Jacques, 1991). Thus, the study employed a rather rigorous methodology for testing the above hypotheses concerning hassles as a source of occupational stress.

Method

Participants and procedure

The sample included 41 military jump masters (parachute trainers) in a parachute training and operations facility. All were males, 19–23 years old, doing their compulsory military service after graduation from high school. Participants slept on the premises, and performed their duties according to diversified daily schedules worked out by the senior jump master. Most tasks were based on 4-hour blocks, with 1–2 hours in between. Thus, participants typically had a morning assignment, one in the afternoon, and occasionally an evening or night assignment. These time frames permitted flexible task rotation, so that each individual performed a wide variety of standardized tasks. The mid-day break served as a buffer, absorbing morning assignment delays without disrupting afternoon assignments. Since it was considered common for hassles to extend assignment duration by 30–60 minutes, the mid-day break was designed to enable some rest and time for lunch. The daily routine included an end-of-day debriefing, following which the senior jump-master rated hassles' severity separately for the morning and afternoon activities using a four-item scale whose reliability was tested prior to data collection. The standardized tasks made detection of disruption and rating its severity relatively easy. Assignment complexity of the morning and afternoon tasks was determined prior to data collection, using both expert ratings and personal self-report ratings by each participant. The dependent variables were collected using repeated measures on five consecutive days, i.e. one working week. Subjective workload was measured twice daily: during the lunch break, and upon completion of the afternoon assignment. End-of-day mood and fatigue were measured before going to bed, whereupon participants completed also an hourly activity chart covering the previous 24 hours, including sleep. Data collection extended over 4 weeks, with about 10 individuals participating in any given week.

Measures

Assignment complexity (expert) was measured on a 22-point scale developed in two stages prior to data collection. First, the six assignment clusters comprising the jump master's job were obtained by means of job analysis. These clusters were rank-ordered individually by five experienced jump masters, from the most to the least complex. This was done using criteria such as: level of standardization (highly standardized assignment vs. highly non-standardized), decision-making requirements (much decision making vs. little decision making) and signal monitoring requirements (many different signals vs. few different signals). This procedure produced complete agreement among the judges. The six clusters, in the same rank order, are: troop training; aerial duties—troop send-off; aerial duties—material send-off; high-alert team; administrative duties; and routine duties. In the second stage, the three or four assignments included in each cluster were rank-ordered internally from most to least complex. Full agreement was obtained for the top and bottom assignments in each cluster. There were only slight discrepancies in the order of the remaining assignments (i.e. one step above or below the rank assigned by the majority of judges). These disagreements were resolved during a group discussion. In a confidential and anonymous questionnaire filled two days later, all judges expressed full agreement with the final list. The results are treated as ratings in our analyses, based on the assumption that, with a large number of ranks, interval lengths approach equality and derived data approach normal distribution.

Assignment complexity (self-report) was designed to complement expert ratings by reflecting personal opinions concerning assignment complexity. Each participant was first asked to rank the complexity for each of the six clusters described above. They were then asked to rank the three or four assignments within each cluster according to the same criteria. Emphasis was placed on judgments based on personal feelings regarding the various assignments. To verify the stability of this ranking, 12 participants were asked to repeat the procedure some 2 months later. The order of task clusters did not change, whereas some shifts were noted within clusters. This resulted in a fairly high Spearman's paired correlation coefficient ($r = .89$), supporting the scale's reliability. Using the experts' scale as criterion, the individual-based scale correlated with it at .83. In other words, individuals and experts utilized the same task parameters for judging assignment complexity. As a result of hindsight, the whole process of obtaining the individual-based data was undertaken after the data collection phase.

Hassles severity was measured after each daily debriefing on a four-item scale completed by the senior jump-master, serving as an expert. Debriefing sessions were quite short, factual and intended for gathering information and problem solving, rather than performance evaluation. Except on rare occasions, hassles were caused by external factors. Frequently encountered hassles included transportation delays (ground or aerial), missing equipment to be picked up at designated storage locations, temporary communication breakdown (as when ground officer or pilot failed to respond on radio), trainees' errors or misconduct, administrative hassles, last-minute changes in wind velocity, etc. Virtually all of these occur unexpectedly, despite the best efforts at coordination by the technical support staff. They are beyond participants' responsibility or control (e.g. transportation schedules or equipment storage are handled by support staff). The senior jump master's ratings had to reflect severity of disruption, by comparison with disruption-less conditions for the same assignment. Hassles' severity was rated on a 9-point scale (not at all–a great deal) with regard to the following items: Were there any more problems than usual?; Was it more difficult than usual to complete some phase on schedule?; Was there any more pressure than usual at any phase?; Was the task more demanding than usual (physically or mentally) at some phase? Hassles' severity was computed as the mean score for these questions. The reliability of this scale was tested before data collection by having a second senior jump master attend 14 debriefing sessions. The paired correlation between the two judges was .81 ($p < .01$), supporting the scale's reliability. Internal reliability, based on the complete set of data, resulted in an alpha coefficient of .86.

Subjective workload was assessed with the Task Load Index, or TLX (Hart & Staveland, 1988), after deleting the frustration-related item from this scale in order to eliminate overlap with negative mood. Respondents were asked to rate how mentally demanding the task was (mental demand); how physically demanding (physical demand); how rushed the pace was (temporal demand), how much was accomplished (performance level); and how hard was it necessary to work in order to accomplish the level of performance (effort). Items were accompanied by 9-point scales, varying from 'very low' to 'very high'. TLX has been extensively used and is highly reliable in terms of psychometric properties and operator acceptance in various fields (Hill, Iavecchia, Byers, Bittner, Zakland & Christ, 1992). We used the shorter computational procedure as proposed by Byers, Bittner & Hill (1989), summing across the five items to obtain an overall TLX score. Alpha reliability of this scale was .92.

Negative mood was measured with the 10 adjectives of the NA scale in PANAS–Mood version (Positive Affect and Negative Affect Scales; Watson, Clark & Tellegen, 1988). Sample items included: irritable, upset, hostile, ashamed and nervous. None of the items overlaps with the fatigue adjectives used this study. Since this measure can be used as a trait or state scale, depending on instructions, participants were instructed to rate each adjective to describe their mood during the evening (i.e. the last 3 hours), using a 5-point scale varying from 'not at all' to 'extremely'. This scale has been extensively validated both as a measure of mood and as trait negative affectivity (Watson, 1988). Alpha reliability of this scale was .92.

Fatigue was measured with four adjectives from the Fatigue scale in POMS (Profile of Mood States; McNair, Lorr & Droppleman, 1981). The adjectives here were: fatigued, tired, exhausted and spent, and they were rated on the same 5-point scale as negative mood. According to the circumplex model of emotion (Russell, 1980), fatigue relates to the unpleasant–low arousal quadrant of emotion, as opposed to negative mood which relates to the unpleasant–high arousal quadrant. They are thus considered complementary measures of emotional state. Alpha reliability of this scale was .82.

Finally, *sleep loss* on the previous night due to official assignments was used as a control variable in the statistical model. This was done given the frequency of night assignments and their potential effect on dependent variables. Sleep loss was measured on the daily activity chart, which also included an hour-by-hour account of the participant's activities in the preceding 24 hours. These charts were compared with the official daily assignment schedule, to ascertain that sleep was marked during off-duty hours. Based on these data, sleep loss was calculated as the daily deviation from the participant's own mean number of available sleep hours during that week. As noted, since reduced availability of sleep hours resulted from operational or administrative duties, participants were requested to indicate the number of hours available for sleep, rather than difficulty in falling asleep.

Statistical model

The statistical model was based on pooled-time series analysis (Jaccard & Wan, 1993; Pedhazur, 1982; Sayrs, 1989), the dominant statistical approach for daily experience studies (West & Hepworth, 1991). This technique combines participant cross-sections and time series (or repeated measures within participants), and employs ordinary regression analyses on the total participants*occasions matrix. Its main advantage is the partitioning of explained variance into variance due to persons (cross-sectional), temporal factors (within-persons), and interactions between the two. This controls confounding of between- and within-participants variance, thus increasing analysis sensitivity and enabling the study of time-variant phenomena with relatively small samples (Sayrs, 1989). The typical approach to repeated measures in regression analysis is to enter *N*-1 dummy variables (representing *N* participants) in step 1 of the statistical model, thus capturing variance in the dependent variable attributable to individual differences. This is analogous to adjusting observations by each person's mean response on the dependent variable, as performed, for example, in the study of daily mood by Bolger, DeLongis, Kessler & Schilling (1989). This approach was adopted in the present study, since there were no interesting individual-difference variables. Variables subsequently entered into the statistical model can be tested, therefore, after between-participants variance is removed. This eliminates the possibility of non-constant error variance, or heteroscedasticity, which is especially relevant when mood and fatigue are the dependent variables, because of individual differences in positive and negative affectivity (Watson, 1988).

Of special concern in pooled-time series is serial dependency, or temporal lag effects (i.e. autocorrelation effects). This may give rise to some confounding, since values of the dependent variable on any given day may be affected by its previous states (Bolger *et al.*, 1989). Lag effects can be tested by entering previous states of the dependent variable as predictors of current state. If present, serial dependency can be controlled by including previous dependent-variable scores in the regression equation before entering the relevant predictor variables. We conducted preliminary analyses both for serial dependency and day-of-the-week effects. The day-of-the-week effect was tested by entering *N*-1 dummy variables (representing the 5 days of the working week) in the regression equation. Each day was thus compared with the first day of the week, in an attempt to discern a possible weekly trend. Previous day effect was tested by entering the values of the dependent variable on the previous day in step 1 of the regression equation. Neither analysis showed evidence of serial dependency, so these predictors were not included in the statistical model.

An additional test involving temporal trends examined the effect of the morning assignment variables on end-of-day mood and fatigue, by entering last-task variables in step 1, previous-task variables in step 2, and inter-task interactions in step 3. None of the previous-task variables affected the dependent measures, for which reason the statistical model included only last-task predictors. Finally, possible non-linear relationships between predictors and outcomes were tested, in view of the arguments concerning non-linearity between assignment complexity and psychological reaction (Edwards & Cooper, 1990). Especially, we expected assignment complexity and negative mood to be non-linearly related, as discussed above. Non-linear trends were examined by including the linear, quadratic and cubic forms of the predictor variables in the statistical model. No evidence was found for non-linear relationships, hence only the linear forms were retained. Based on the above, the following statistical model was used:

$$Y_{it} = b_o + b_1 \ aC_{itk} + b_2 HS_{itk} + b_3 \ (AC_{itk} {}^* HS_{itk}) + e_{itk} \qquad (1)$$

where Y is within-participant residual mood or fatigue of participant i on day t, AC is the assignment complexity score of participant i on day t for task k, and HS is the hassles severity score of participant i on day t for task k. Number of cases (*N*) for this model is provided by participants*days ($N = 41{}^*5 = 205$), with some missing data in different analyses.

Results

Descriptive statistics and intercorrelations among the variables in the statistical model are presented in Table 1. To control confounding of within- and between-participants variance, the correlations are based on within-person standardized scores. Table 1 supports the following expectations: (*a*) assignment complexity (AC–expert) and hassles severity (HS) had a correlation of .14 ($p < .05$), enabling its treatment as little correlated independent variables; (*b*) HS correlated significantly with negative mood ($r = .30$, $p < .01$), subjective workload ($r = .33$, $p < .01$) and fatigue ($r = .32$, $p < .01$). These are the highest correlations in the matrix, supporting hypotheses 1 and 2; (*c*) AC correlated less well with the dependent variables, exhibiting the following correlations: $r = .05$ (n.s.) with mood, $r = .24$ ($p < .01$) with workload and $r = .18$ ($p < .01$) with fatigue. Overall, therefore, HS is better associated with the dependent variables than AC.

In order to test hypotheses 1 and 2, hierarchical multiple regression was used. Sleep loss was entered first, followed by assignment complexity and then hassles' severity. Note that, with repeated measures, the between participants variance was removed from this regression model, as explained above. The dependent variables in this case refer to daily deviations from the participant's own mean for each variable. The results of this analysis are presented in Table 2, where the main test of the hypotheses is provided in step 3. As can be seen in this table, HS provided highly significant incremental prediction of all three outcome variables, supporting the above hypotheses. R^2 increments were as follows: $\Delta R^2 = .09$ ($p < .01$) for mood; $\Delta R^2 = .05$ ($p < .01$) for fatigue; and $\Delta R^2 = .04$ ($p < .01$) for workload. Since between-participants variance has been removed, these effect sizes are quite large (West & Hepworth, 1991). The entire procedure was first replicated with individual ratings of AC (i.e. AC-I). This was intended to test the effect of task complexity after personal preferences had been taken into account (i.e. what the experts consider as the most demanding task may be judged differently by others). A second replication was performed with dummy-coding of hassles, identified as HS-D. The dummy-coding of this variable was based on the first item of the disruption scale (i.e. 'Were there any more problems than usual?'—'Not at all/A great deal'). In this case, 'Not at all' was coded 0, and any other response was coded 1. These replications revealed the same pattern of results. Expert ratings and individual ratings of AC had a correlation of .83 ($p < .001$), which suggests that experts and participants used essentially the same parameters in judging task complexity, though personal preference did introduce some independent variation. With AC-I in the statistical model, the incremental effect of HS was as follows: $\Delta R^2 = .09$ ($p < .01$) for mood, $\Delta R^2 = .04$ ($p < .01$) for fatigue and $\Delta R^2 = .05$ ($p < .01$) for workload. As for hassles as a dummy-coded variable, this reduced effect size, although it remained significant. The incremental effect of HS-D was as follows: $\Delta R^2 = .03$ ($p < .05$) for mood, $\Delta R^2 = .06$ ($p < .01$) for fatigue and $\Delta R^2 = .02$ ($p < .05$) for workload.

Hypothesis 3 specifies an interaction between AC and HS. Step 4 in Table 2 tests this interaction effect. As can be seen, the interaction was significant with regard to mood ($\beta = .13$, $p < .05$), nearly significant with regard to fatigue ($\beta = .09$, $p < .10$)

Table 1. Descriptive statistics and correlations among variables in the statistical model ($N = 41*5 = 205$)

Variables		*M*	SD	1	2	3	4	5	6
1.	Assign. complexity	11.8	8.33	—	0.14	0.05	0.18	0.24	0.03
2.	Hassles' severity	9.54	4.48		—	0.30	0.32	0.33	0.10
3.	Negative mood	7.49	3.91			—	0.23	0.15	0.19
4.	Fatigue	8.79	3.81				—	0.25	0.13
5.	Partic. workload	31.1	9.60					—	0.09
6.	Sleep loss	7.05	2.52						—

Correlations of 0.13 and above are significant beyond $p < .05$; correlations of 0.15 and above are significant beyond $p < .01$; correlations are based on within-person standardized scores.

Table 2. Multiple hierarchical regression models for testing main and interaction effects of predictors on mood, fatigue and workload (beta coefficients of the full model)

Predictors	Negative mood ΔR^2	Negative mood β	Fatigue ΔR^2	Fatigue β	Workload ΔR^2	Workload β
Step 1						
Sleep loss	0.02*	0.10[a]	0.01	0.06	0.01	0.04
Step 2						
AC	0.00	0.01	0.04***	0.017***	0.05***	0.22***
Step 3						
HS	0.09***	0.30***	0.05***	0.23***	0.04***	0.18***
Step 4						
AC*HS	0.02*	0.13*	0.01[a]	0.09[a]	0.00	0.01

*$p < .05$; **$p < .01$; ***$p < .001$.
[a]$p < .10$.
AC = assignment complexity; HS = hassles' severity.

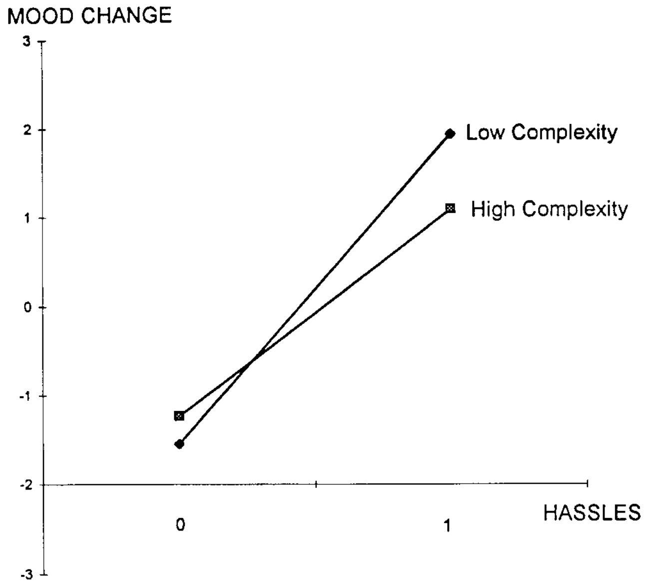

Figure 2. The interaction between assignment complexity and hassles' severity with mood as dependent variable (deviations from the individual's mean mood over 5 days).

and insignificant with regard to workload. Since recent approaches call for more liberal significance criteria for interaction terms (McClelland & Judd, 1993), both interactions are considered statistically significant. Figure 2 presents the hassles*complexity interaction with mood change as dependent variable. The figure indicates, first, that hassles exert a strong main effect on negative mood. However, contrary to expectations, this effect increases when hassles are encountered on less complex assignments. A similar pattern, though less pronounced, is evident with regard to fatigue as dependent variable. This unexpected interaction may be attributable to coping options being more restricted in less complex assignments. This would result in less efficient coping whenever hassles are encountered, despite greater availability of energetic resources.

Discussion

The study was designed to test the effect of occupational hassles on negative mood and effort exertion, with the latter measured by fatigue and subjective workload. This was done with daily recordings of the independent and dependent variables over five consecutive days. Pooled-time series analysis (Pedhazur, 1982; Sayrs, 1989) based on repeated measures provides a solution to common method variance, which is a major problem in most hassles' studies (Dohrenwend & Shrout, 1985; Lazarus, Delongis, Folkman & Gruen, 1985). The study also employed expert-based ratings for the independent variables, as a means of controlling criterion contamination, offering an additional methodological advantage over previous hassles' studies. The results supported the hypotheses concerning the incremental effect of hassles on all three outcome variables. An examination of beta weights presented in Table 2 indicates that hassles' severity offers the best prediction of mood and fatigue, while assignment complexity offers a slightly better prediction of subjective workload. Considering the methodological strengths of this study, these results strongly support the idea that occupational hassles play an important role in occupational stress. This indicates that they require more attention than has been accorded to them to date.

As noted in the introduction, the study was not designed to test alternative explanations concerning the effect of hassles on mood, fatigue and workload. These require different explanatory constructs, namely, operational costs of coping with disruption (Schonpflug, 1986*a*, *b*), cognitive appraisal resulting in perceived threat or harm due to disruption (Lazarus, 1991) and slower rate of progress as a result of disruption (Carver & Scheier, 1990). In field settings, as in the present study, hassles are likely to entail all three. The following example demonstrates this point. Transportation problems on the way to the airport may cause unscheduled delays in take-off, which would necessitate readjustments of the mission. The affected jump master has then to invest extra effort in solving the problem of getting troops or equipment to the airport as soon as possible. This may be achieved by securing an alternative vehicle, sending a mechanic as fast as possible, or modifying boarding arrangements so that those not affected by the problem would board the planes first. Any one of these alternatives requires the jump master to coordinate all other parties, including air force personnel, ground officers waiting at the landing site, and operations officers of both home and host units. In terms of the theoretical constructs, each of these coping alternatives requires effort expenditure due to complex coordination requirements. During this time, rate of progress is slower than planned, affecting the second theoretical construct. Cognitive appraisal of the situation, i.e. the third theoretical construct, will probably indicate personal threat, since the jump master will face conflicting pressures from the affected parties (e.g. pilots may wish to abort the mission unless the problem is solved within a short time, while operations officers may urge the opposite). Thus, all three factors are operative when non-trivial hassles are encountered in field situations. Understanding the effect of work hassles on emotional and behavioural parameters may thus require integration of the three theoretical approaches. Alternatively, when data accumulate, it might be possible to classify hassles by the dominant factor and compare differential effects of effort-related hassles with those of threat-related and progress-related hassles. Whether this approach is feasible or not is a matter of empirical testing.

The intricate effect of hassles on behaviour and emotion is emphasized by the unexpected interaction between assignment complexity and hassles' severity as presented in Fig. 2. Contrary to expectations, the effect of hassles on mood and fatigue was greater during low complexity assignments, especially for negative mood. The model of operational costs led to the hypothesis that reduced availability of energetic resources during more complex assignments would result in greater disruptive effect of hassles. In fact, the reverse was true, though the interaction effect was much smaller by comparison with the main effect of hassles. One possible explanation relates to coping options which are closely related both to controllability and to effort expenditure. According to this explanation, assignment complexity covaries with job control (decision latitude), a possibility which is supported by the reportedly high correlations between the two variables (Frese & Zapf, 1994). Cognitive appraisal theory proposes that negative emotion is inversely related to coping options as appraised by the individual (Lazarus, 1991; Lazarus & Folkman, 1984). The greater the number of options for coping with a stressor or hassle, the less the threat, resulting in reduced psychological stress (Fox, Dwyer & Ganster, 1993; Karasek, 1979; Landsbergis, 1988; Spector, 1987). Similarly, more coping options will also reduce the effect of hassles on fatigue, since problem solving becomes easier, resulting in less mental effort. Overall, therefore, assignment complexity can have both positive and negative effects on the hassles–distress relationship. In the present case, it seems that more complex assignments offered more coping options when hassles were encountered, resulting in a reversal of the expected interaction with regard to mood and fatigue. In the above example of transportation delays, several options could have been pursued. Energy consuming as these options were, at least they were available, rendering the individual in control of the situation, thereby moderating negative mood to a certain extent. In less complex assignments, such as performing ground officer duties at the parachute landing site, coping options would have been much more limited. The main task in this case consists of monitoring the various safety parameters. If any parameter exceeds the designated limits, or meteorological devices show unreliable readings, there is little one can do but send a message to the operations officer in charge. Due to geographical remoteness of parachute landing sites, each obstacle implies considerable delays. Attempts to solve problems on site are usually restricted by scarcity of coping options. Quite often, therefore, complexity goes hand-in-hand with flexibility and inter-changeability which, although more difficult to regulate, provides more coping options when things go wrong. If this explanation is correct, coping potential must be considered as moderator of the relationship between hassles' severity and negative mood. This, of course, requires further study.

Sleep loss is another possible moderator of the hassles–mood and hassles–fatigue relationships. Number of hours of sleep was repeatedly shown to affect performance level, especially later in the day (Bonnet, 1985; Buck, 1975; Friedman, Globus, Huntley, Naitoh & Johnson, 1977; Krueger, 1989; Meijman *et al.*, 1993; Samkoff & Jacques, 1991). Thus, sleep loss is apparently conducive to effort investment in order to maintain performance. Since hassles also require effort investment, the model of operational costs (Schonpflug, 1986*a*, *b*) suggests a greater disruptive effect if hassles are encountered after some sleep loss on the previous night. This prediction was tested *post hoc*, using the statistical models presented in Table 2. The results indicated that, with negative mood as dependent variable, assignment complexity interacted with sleep loss ($\beta = .12$, $p < .05$). However, this did not apply for hassles' severity, indicating that its strong main effect was not moderated by sleep loss, contrary to predictions of the operational costs model. For fatigue, none of the interactions was statistically significant. It seems, therefore, that the effects of hassles do not depend on sleep loss, and they remain strong regardless of prior sleep loss. Once again, more studies of variables that moderate the effect of hassles are required.

The absence of lag effect of hassles is also worth noting. As noted in the statistical model section, neither morning hassles, nor global hassle scores for the previous 24 hours exhibited incremental effect beyond the last disruption. With end-of-day recording of mood and fatigue, this means that earlier hassles have no cumulative effect several hours later. This might be due to the mid-day break between assignments, and the change of assignments at that time. The minimal time blocks in this study spanned 4–5 hours, so it would be interesting to conduct a study examining the temporal course of post-disruption effects, using smaller time units. It might well be that hassles must have a certain density (i.e. follow each other at a certain rate), or that fewer opportunities for replenishment should be available, for their effect to accumulate over time. During informal discussions, participants often referred to assignment rotation at mid-day as a very refreshing aspect of their job. Similarly, job rotation is an effective intervention strategy for reducing burnout (Murphy, 1988). In other jobs, hassles might recur quite frequently while opportunities for replenishment are limited, so this would be an interesting issue for future research. The combination of high hassles density and low recuperation opportunities might explain, for example, the higher incidence of burnout in the helping professions as well as in many managerial and supervisory jobs (Cordes & Dougherty, 1993; Maslach, 1982). To summarize, this study adds to the small body of relevant evidence and demonstrates that hassles constitute a potent source of stress at work despite their transient nature. It offers a conceptual model integrating hassles' severity and assignment complexity as predictors of emotional and behavioural outcomes. These data, and the suggestions for future research discussed above, indicate that closer examination of this disregarded occupational stressor is advisable.

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