THE ROLE OF THE INDIVIDUAL IN FATIGUE MANAGEMENT

Brad Strahan Psychologist

Abstract

While it is clear that the individual has a definite role in managing fatigue, little research has specifically identified those aspects of individual functioning that make for effective coping with fatigue.

This paper explores variations in how people cope with fatigue at work. Our exploration is informed by the theoretical framework that has evolved over the past two decades of research on coping with stress.

Three questions arise out of the applications of coping theory to fatigue management:

- Is it possible to identify variations in individual coping with fatigue risk at work?
- Are these variations linked to variations in the demands of the workplace, or to variations in stable personality traits?
- If it is possible to identify various styles of coping with fatigue risk, are these coping styles linked in meaningful way to different safety outcomes.

Results from nine Queensland industrial sites and 1651 people identified different styles of coping with fatigue that were linked to different safety outcomes.

Overall, the results suggest that coping plays a relatively dominant role in predicting fatigue risk at work and that a more deliberate coping style involving planning and organising one's life is linked to increased safety at work.

The evidence also indicates that rigorous work conditions elicit more deliberate coping responses but these may not mitigate the risk inherent to more rigorous workplace conditions.

Introduction

'Fitness for duty' is generally conceptualised as a set of mutual responsibilities shared between employers and employees. These mutual responsibilities involve the responsive design of the workplace and responsible personal management.

While it is clear that the individual has a definite role in managing fatigue, little research has specifically identified those aspects of individual functioning that make for effective coping with fatigue.

The present paper draws on data from 1651 people from nine Queensland industrial sites that go some way in identifying specific aspects of the role of the individual in effectively managing fatigue in the workplace.

A theoretical model

The broad theoretical model that has informed our work with fatigue in the workplace relies on the research literature on coping that has emerged over the past two decades.

The coping research developed as a reaction to questions about individual differences in stress response.

Reacting to earlier models of stress that emphasised the severity of life-events as predictors of stress response (ie Holmes & Rahe, 1967), the coping literature emphasised the importance of identifying those aspects of individual functioning that allowed some people to cope more effectively than others (Carver, Scheier, & Weintraub, 1989; Billings & Moos, 1981; Holahan & Moos, 1987; Lazarus & Folkman, 1984).

The coping research demonstrated that active or problem-focussed coping significantly moderates the adverse effects of stressful or negative life events on physiological functioning and well-being.

Active coping is the process of taking deliberate steps to meet the challenge that faces the individual.

Active coping includes:

- initiating direct action
- increasing one's efforts
- planning and organising action strategies
- restricting other activities that might compete with or inhibit effectively responding to the stressor
- actively seeking additional knowledge or social support (see Carver et al, 1989).

In contrast, avoidant coping involves:

- efforts aimed at reducing the tension created by the stressor
- or avoiding the real problem, eg smoking or drinking, getting involved in alternative activities, blaming others, and denying the importance of the stressor.

Other researchers (eg Lazarus & Folkman 1984) have described emotion-focussed coping as expending effort on coping with the immediate emotional tension that the situation generates for the individual rather than directing efforts towards meeting the challenge.

The evidence from the coping literature overwhelmingly supports the view that avoidant or emotion-focussed coping leads to poorer outcomes.

Although most stressors elicit both kinds of coping types, active or problem-focussed coping

tends to predominate when people feel something positive can be done, whereas avoidant or emotion-focussed coping tend to predominate when people feel nothing can be changed or that the stressor is something that must be endured.

Such evidence suggests that situational cues determine the coping style an individual employs in a specific situation or environment.

However, a number of studies have linked traditional personality differences to coping style. Optimism, self-confidence, neuroticism, mastery and an internal locus of control have been linked to more effective coping (Scheier, Weintraub, & Carver, 1986; Parkes, 1984).

The individual who assumes s/he can influence the environment (an internal locus of control) inevitably enjoys better health than the individual who assumes s/he cannot influence their environment, that they are victims of the world around them and control is attributed to external forces or identities (Rotter, 1966).

Such results suggest that dispositional factors or preferred coping strategies determine particular coping responses.

Fatigue risk at work

We have conceptualised fatigue risk at work as arising out of the interaction between an individual and the workplace. Both workplace design and practice, and individual functioning can contribute to an unacceptable level of fatigue risk at work (see figure 1).

We have wanted to avoid the position that workplace factors alone, or alternatively, individual coping alone are the sole explanation for safety outcomes at work.

Potential workplace factors that might contribute to fatigue risk include the distribution of time at work (ie hours of work, roster design, breaks in shift), the nature of the work performed, and the conditions of the work environment including the social relationships.

Individual factors that might contribute to fatigue risk in the workplace include variations in coping with fatigue, aspects of lifestyle, hours of sleep, family support, and any physiological or psychological factors that might be predispose people to poor functioning at work.

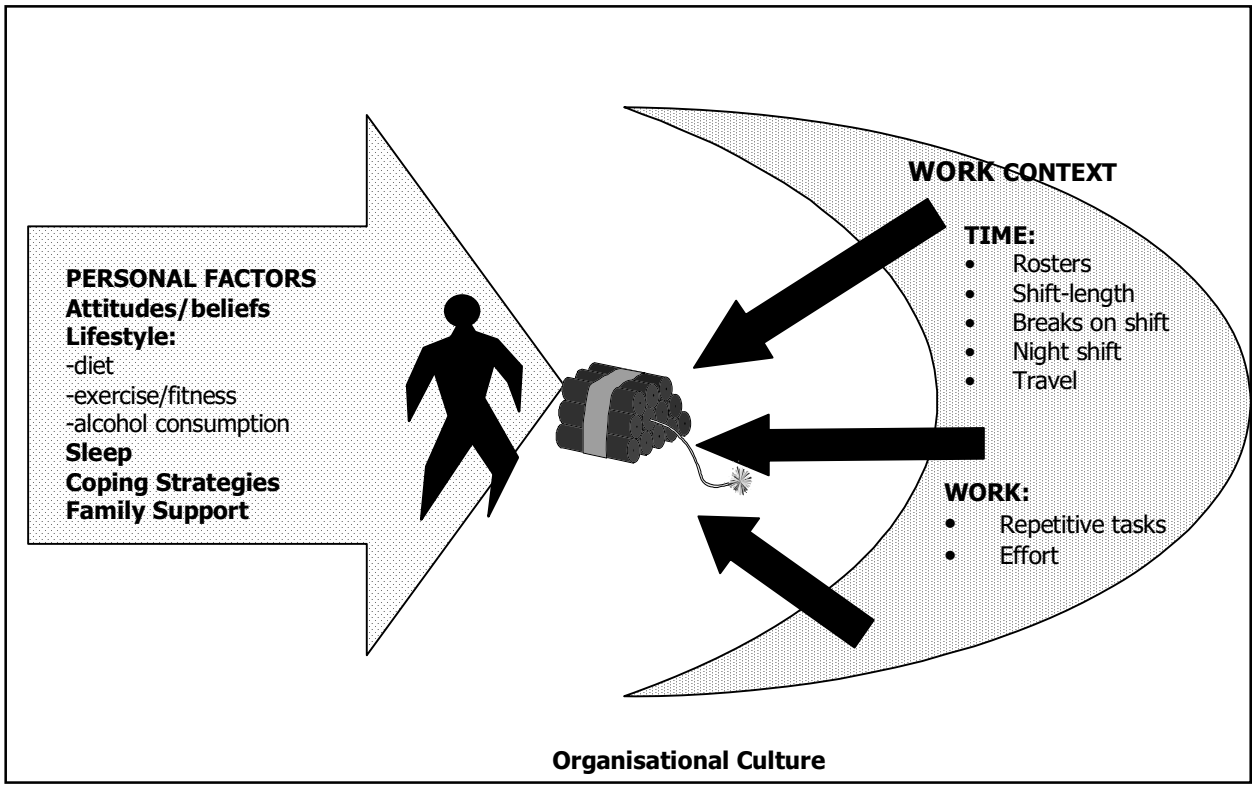
The critical task of safety personnel is to identify those aspects of the workplace, or of individual functioning that might make fatigue-related incidents or injury more or less likely to occur in the workplace, and then to introduce effective controls to reduce the risk.

It is suggested that little research has specifically set out to systemically explore individual factors that might contribute to fatigue risk in the workplace.

The 'coping' framework applied to fatigue

The application of the 'coping' framework to our understanding of fatigue in the workplace invites a series of questions about coping with fatigue. Firstly, there is a set of issues surrounding the question of whether it is possible to identify various styles of coping with fatigue in the workplace. And, if it is possible to identify different ways of coping with fatigue, to then isolate the defining characteristics of these potentially different ways of coping with fatigue.

A second question concerns whether these differences in coping might arise out of the differences in the work environment or from inherent individual differences. We could refer to these two types of differences as situational differences and dispositional differences. Situational differences in coping arise out of the nature of the situation in which people find themselves. On the other hand, dispositional differences arise out of the nature of the people rather than differences in the situation, and would be linked to stable personality differences.



A third and critically important question concerns the possibility of demonstrating links between the different ways of coping with fatigue and the specific outcomes of fatigue risk and safety at work.

Finally, a fourth question addresses the relative contribution of coping to fatigue risk when compared with other factors that might be linked to fatigue risk in the workplace.

Our work in industry

While the above research and questions have inevitably informed our thinking about the role of the individual in managing fatigue, our actual work has inevitably required a focus on a broader view of fatigue in the workplace.

Our investigations have essentially played the function of identifying those aspects of the workplace design and of personal functioning that contribute to fatigue risk in specific industrial operations.

The data reported below draws on questionnaire data collected from site-wide studies at nine different Queensland mines and one Queensland group involved in the power industry. At each site considerable care was taken to ensure either all personnel completed forms, or that a representative sample was drawn from each operation.

Summary of the results

A key question in each of these studies has been identifying the proportion of people who had personally experienced a near-miss over the past month of their work, that they believe was caused by fatigue.

In each study we examined those aspects that might make it more or less likely that people experience a fatigue-related near-miss. While other indicators of fatigue risk at work were used, this question seemed to come closest to real fatigue risk while at work.

Table 1 presents a summary of the sites, people involved in each study and the proportion of people at each site experiencing a near-miss.

A cursory examination of the above results suggests that underground operations may run a higher degree of risk than surface operations in terms of fatigue and safety.

However, the Site 9 open-cut operation stands out as an exception to this pattern.

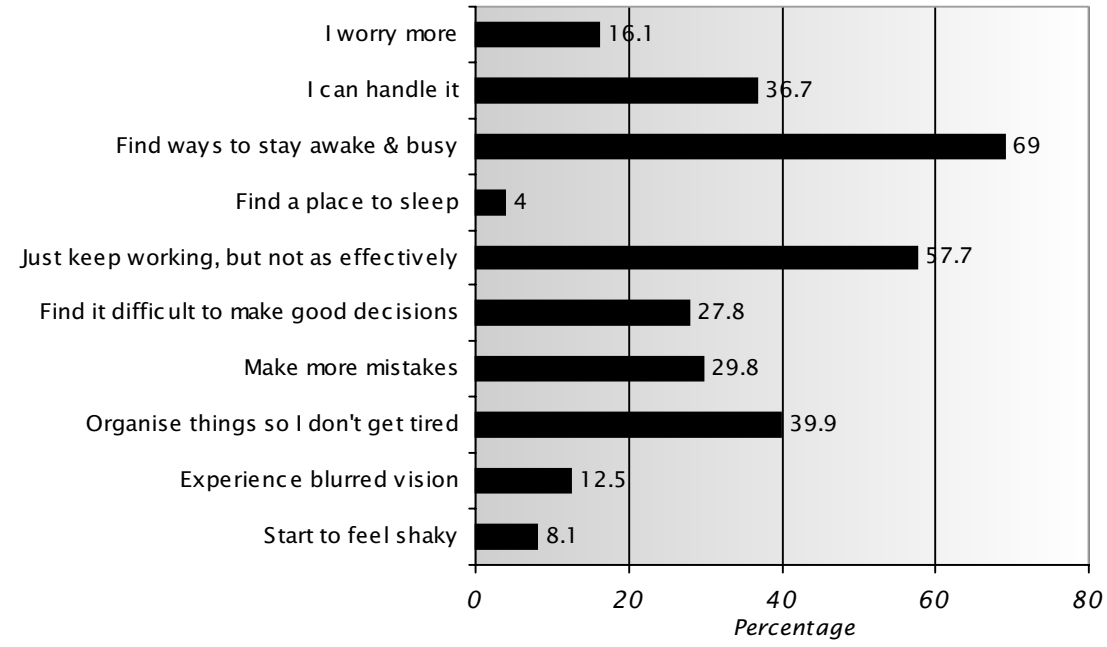
Identifying styles of coping with fatigue

In the first study we included 10 items in the questionnaire that represented a checklist of the various ways of coping with, or responding to the experience of fatigue at work. Respondents indicated

Table 1
Summary of sites and proportion of people experiencing a fatigue-related near-miss in the past month of work.

Site	Type of Industry	N	% reported near-miss	Year of study
1	U/G Coal	248	20.4%	2000
2	U/G Coal	92	30.3%	2000
3	O/C Coal	379	11.0%	2001
4	Power Dstribution	58	14.0%	2001
5	O/C Coal	200	10.7%	2001
6	U/G Metalliferous	178	20.8%	2001
7	O/C Coal	227	11.3%	2001
8	U/G Coal	138	20.3%	2001
9	O/C Coal	101	20.9%	2001
10	O/C Coal	30	3.3%	2002

Figure 2. Proportion of respondents adopting coping responses to feeling very tired at work



which of the items was typical of their functioning when they were really tired at work. We examined the data in a number of ways. Figure 2 presents the raw data from the sample. There were no differences between roster or work groups.

A cluster analysis of the data identified three quite different styles of coping with or responding to fatigue in the work place. Figure 3 presents the differences between the clusters on the coping items. Items were scored 0=not indicated or 1=indicated. Mean scores then represent the proportion of the sample indicating each item.

The first group differed from the other groups in being less symptomatic, more likely to plan and organise their life to avoid fatigue and to feel that they could cope with fatigue.

It is not surprising that feeling one could cope with fatigue was linked to more planning and organising.

The second group, while less symptomatic than the third group, were least likely to plan and organise their life to avoid fatigue and felt less confidence in their ability to cope with fatigue.

While the third group were clearly more symptomatic, they were most likely to 'just keep working' when they were really tired at work.

Subsequent analyses indicated that 11.5 percent of cluster 1 people reported experiencing a fatigue-related near-miss in the past month.

This group could be seen as the active copers and were less likely to attribute their tiredness to the roster system. This group worked a longer shift in terms of hours than the other groups (average of 10.3 hours as opposed to 9.7 and 9.6 hours for groups 2 and 3).

One in four (24.5 percent) cluster 2 people reported a fatigue-related near-miss in the past month. They were more likely to report that fatigue was a major contributor to accidents than cluster 1, and less likely to agree that they could work effectively even when tired. Further, cluster 2 people reported working shorter shifts than cluster 1 people.

Nearly half (47.4 percent) of cluster 3 people reported a fatigue-related near-miss in the past month. Clearly, this group reported more symptoms of fatigue, they were most likely to agree that fatigue was a major contributor to accidents, but tended to work the shorter shifts.

Cluster 3 people were most likely to attribute their tiredness to the roster. Safety was more a product of coping than of rosters and shift length.

These data provide an initial response to our questions one and three. It does seem possible to identify different styles of coping and to identify specific characteristics of these various styles.

Further, these differences seem to be related in meaningful ways to fatigue risk and safety at work.

Planning and organising seems to play a critical role in discriminating between those people who cope well and those who don't cope as well with fatigue. Planning is typically seen as a major component of active and problem-focussed coping and has been associated with optimal outcomes (see Carver et al, 1998).

The data also suggests that a minority of people may be more symptomatic of fatigue and that increased symptoms of fatigue is related to increased fatigue risk at work in spite of planning and organising.

Descriptions of coping style

In the past four studies we have included a question where we simply asked people if they had a strategy to minimise fatigue risk, and if so to describe their way of managing fatigue. In one project we distributed the same questionnaire across three sites for responses from 466 people. We received 368 descriptions of personal fatigue management. These 368 comments are summarised in

Figure 3. Mean scores on reported symptoms/coping strategies of each cluster. (cluster 1 (n=122); cluster 2 (n=104); cluster 3 (n=19))

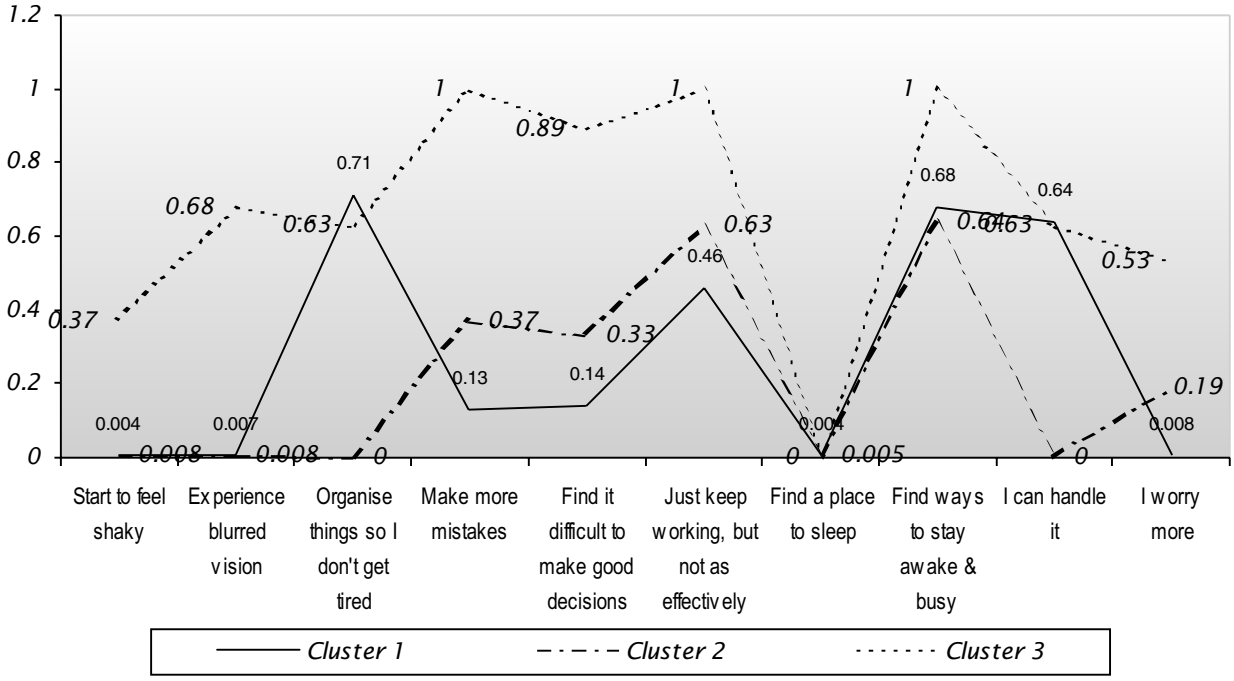


Table 2

The comments fell into three quite different approaches to managing fatigue at work. Preventative strategies involved the active planning to prevent fatigue – ie managing lifestyle, time-off and the job. On the other hand reactive strategies responded to the experience of fatigue by seeking stimulation (ie drinking coffee, splashing water on face, cat-naps during crib time etc.

A more complete view of each type of strategy can be gained by reading Table 2 above. In addition to the preventative and reactive approaches to managing fatigue, there were 50 comments that essentially indicated the individual had no strategy for managing fatigue or assigned responsibility for personal fatigue to someone else.

Subsequent analyses revealed meaningful differences between the coping styles if these analyses were conducted within roster groups. Table 3 summarises these differences within a four on/four off rotating roster group. In addition, near-miss rates are reported for the seven on/seven off roster group from Site 8.

As one would expect, the evidence suggests that people who describe a preventative strategy for managing fatigue tend to do better on other measures as well.

Differences in coping across sites

Differences between the three operations in this

Table 2.
Conscious strategies of fatigue management currently adopted by sample

Conscious strategy to minimise fatigue	Frequency
Preventative Strategies	
1) Managing self (Lifestyle management – sleep, health)	
By actively managing sleep time	109
Manage sleep environment	1
Exercise regularly	11
Constant consideration to nutrition ie. diet/fluids	20
Avoiding/limiting alcohol during the week	11
2) Managing time off	
Limiting activities when on a tour	11
Relaxation, reading, meditation, spend time with family	17
Rest on days off	5
Preparing the day before tour starts – ie take it easy and rest	6
Catch up on sleep on days off	3
3) Managing the job	
Planning time and tasks - setting objectives, sharing responsibilities,	19
Change job/tasks throughout shift ie. task rotation	22
By keeping moving and always doing something, keeping busy	18
Regular short breaks	18
	271
Reactive Strategies	
1) Seeking stimulation or relief from symptoms	
Stimulation seeking: exercise, wash face, coffee, chew gum, crib, walk	19
Cat nap in break or crib time	11
Yes, cut days short if necessary	3
Pacing self, take it easy	6
2) Attempts	
Try to but things always throw plans out, phone calls etc.	3
Find it harder as I get older	1
Yes have a bit of heart	1
Yes, stop when tired	2
	47
No Strategy	
No	46
No as there is always pressure from supervisors to complete work ASAP	1
No, need more sleep	1
You can't	1
You cannot manage your time when you don’t get enough time to do anything	1
	50

same study revealed useful information about coping. Figure 4 presents data on the proportion of people at each of the three sites (regardless of roster) who reported a fatigue-related near-miss in the past month of their work.

While the differences between sites 7 and 8 might be explained in terms of differences between underground and open-cut operations, site 9 represents an anomaly in the data.

Additional analyses revealed no differences between the three sites on measures of the distribution of time at work (ie length of shift, hours between waking and arriving home after work, longest shift in past month), on reports of hours of sleep when working night-shift, day-shift, on days off, or on measures of lifestyle (ie alcohol consumed, ratings of diet, and family support).

A potential explanation of the quite high rate of near-misses at site 9 may lie in the coping style adopted by site 9 people. Figure 5 shows mean scores on a four-point scale for the item 'I have developed effective strategies for coping with fatigue.'

The results from figure 5 indicate that the site 9 group were least likely to report having developed ways of coping with fatigue than people at sites 7 and 8 ($F=4.5$, $p < .01$), and more likely to report finding coping with fatigue very difficult ($F=2.9$, $p < .05$). Further analyses examined the proportion of

Table 3
Differences between groups adopting various fatigue management strategies.

Preventative Strategies group:

- score higher on 'Plan and organise to avoid fatigue'
- consumed less alcohol
- reported more family support
- reported more hours of sleep on night shift
- 16.5 percent of group reported experiencing fatigue-related near-misses in past month (four on/four off roster)
- 36 percent of group reported experiencing fatigue-related near-misses in past month (seven on/seven off roster)
-

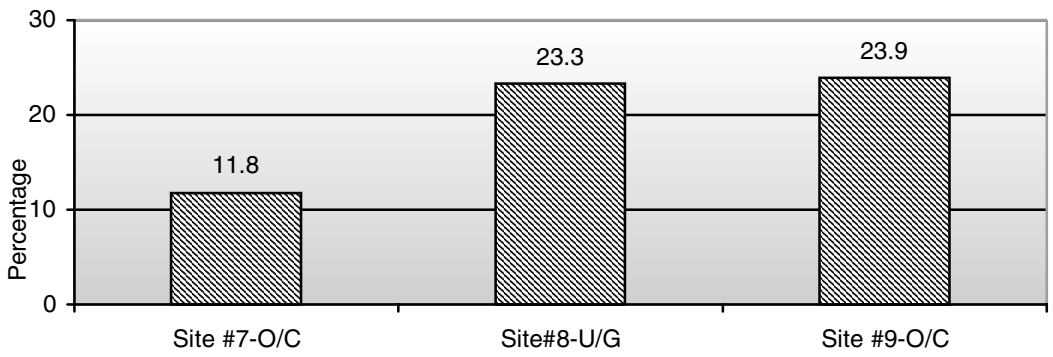
Reactive group:

- more likely to attribute personal fatigue to worry/stress about personal and/or family issues and sleep deficits
- 15.8 percent of group reported experiencing fatigue-related near-misses in past month (four on/four off roster)
- 37.5 percent of group reported experiencing fatigue-related near-misses in past month (seven on/seven off roster)

No Strategy

- scored lowest on measure to plan and organise to avoid fatigue
- more likely to attribute fatigue to weather and environmental conditions and repetitive nature of work
- less experience with shift work
- 27.3 percent of group reported experiencing fatigue-related near-misses in past month (four on/four off roster)
- 57.1 percent of group reported experiencing fatigue-related near-misses in past month (seven on/seven off roster)

Figure 4 Proportion of people at three sites who experienced a near-miss



people at each site adopting various strategies for coping with fatigue, ie preventative, reactive or no strategies. The distribution of coping styles across the three sites is presented in figure 6.

The majority of people at site 7 reported adopting preventative strategies for managing fatigue.

They were more likely to plan and organise their sleeping and rest time and work tasks in order to avoid fatigue. In contrast the most common method for managing fatigue at site 9 was a post-event reaction to fatigue.

The proportion of people adopting a reactive strategy was significantly higher in the Site 9 group than the other two groups.

The above data seems to offer support for a dispositional view of coping - ie people have a preferred method of coping and that is related to how safe people are at work.

However, the role of workplace design should not be understated. Differences between the coping strategies appeared only within roster groups rather than across roster groups, which might indicate the importance of situational changes in coping style among employees. Across site comparisons are invariably difficult because of the many subtle differences between sites and organisations.

However, the site 8 operation included two quite different rosters within the one operation.

Coping with fatigue and situational factors

It is important to note that both open-cut operations operated on a four on/four off roster. In contrast, the production group at the underground site 8 operated on a seven on/seven off roster while the maintenance crews operated on a permanent day-shift roster, five on/two off.

Figure 7 presents differences between the two roster groups at site 8 in the proportion who reported experiencing a fatigue-related near-miss in the past month.

Figure 8 presents data describing the proportion of each roster group in the underground adopting various strategies for coping with fatigue. Staff and administration roles were removed from the data for these analyses.

Clearly the rotating seven on/seven off group were more vulnerable to experiencing a fatigue-related near-miss than the permanent day-shift people. Further, it is unlikely that the differences in tasks between the two groups would explain all of the safety differences between the two groups. The results of figures 7 and 8 bring evidence to the question of whether the differences in safety between the roster groups can be explained in terms of variations in

Figure 5. Mean scores across the three sites on coping items

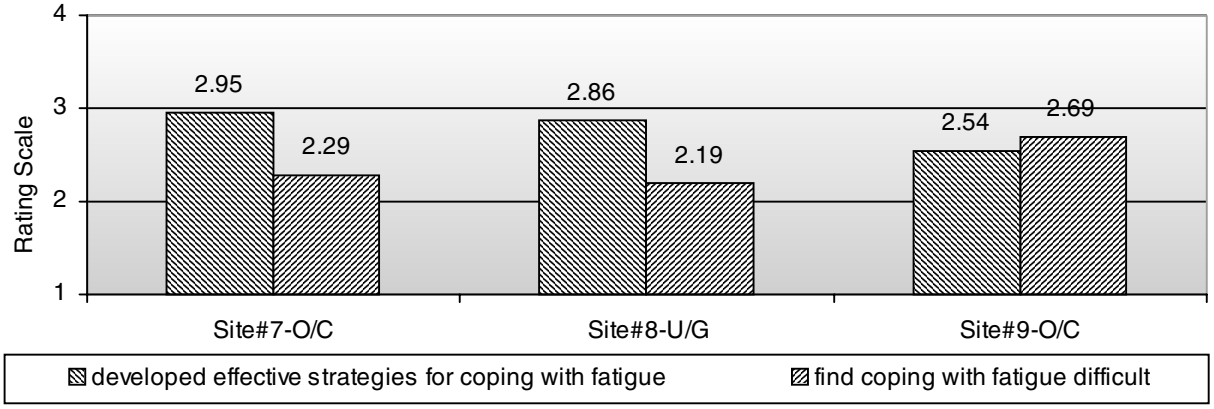
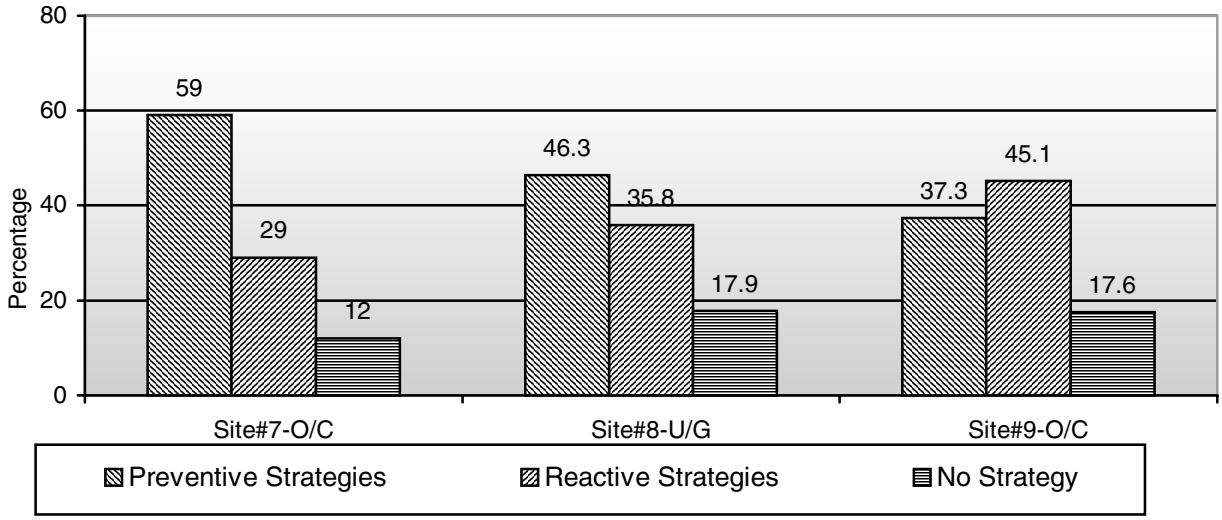


Figure 6 Proportion of people from each site adopting various coping strategies



predisposition and preferred coping style, or because of situational differences.

The evidence from site 8 supports a situational explanation for differences in coping and safety between roster groups.

Within the seven on/ seven off roster group coping differences seem to be a response to the situational demands of the rigours of the roster design, whereas in the five/two permanent day shift roster group, presumably the demands of the roster are less allowing for less deliberate coping strategies.

On the basis of this interpretation of the results, the increased fatigue risk of the seven on/seven off group appear to be driven by situational (roster) demands rather than coping deficiencies.

The seven on/seven off people were more at risk in spite of their attempts to cope more deliberately.

While the above results clearly reveal the importance of individuals adopting a deliberate and conscious strategy to prevent fatigue in the workplace, these results also demonstrate the importance of workplace design.

There are some groups of people that are clearly more at risk than others because of the design of their workplace rather than poor self-management.

Predicting fatigue-related safety at work

In order to address the fourth question, a path analysis of the data provided some sense of the relative contribution of these factors to fatigue risk and workplace safety.

Again, the data from site 8 was particularly useful as the variation in rosters for operational roles on the one site allowed for an evaluation of the variations in rosters as a predictor of fatigue related safety in the workplace.

In path analysis standardised beta coefficients comment on the relative strength of predictors in a subset of the population (see Asher, 1983).

Table 4 lists the measures that were entered into two regression equations with the experience of a fatigue-related near-miss over the past month of work as the dependent variable.

The first regression equation calculated the

Figure 7 Proportion of underground people on various rosters who report a fatigue related near-miss in the past month

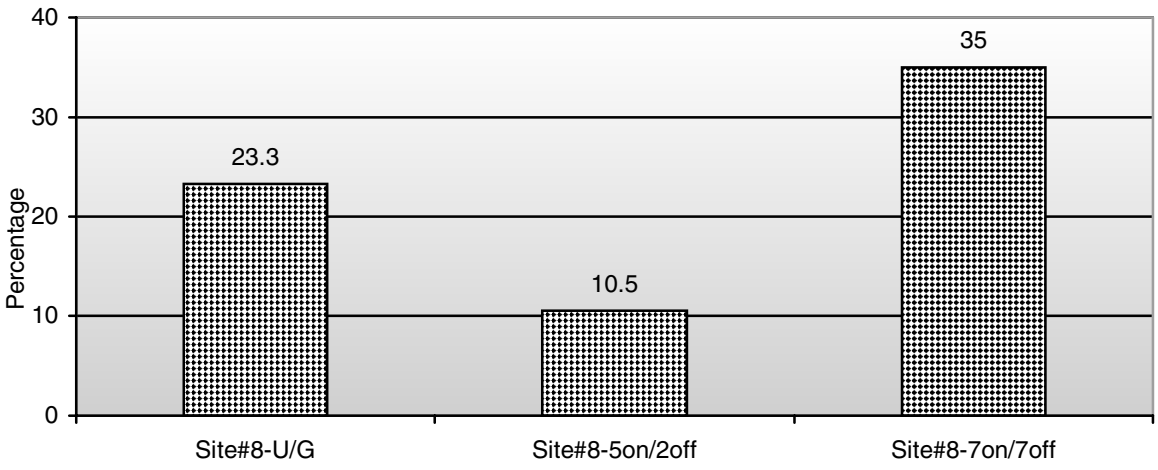
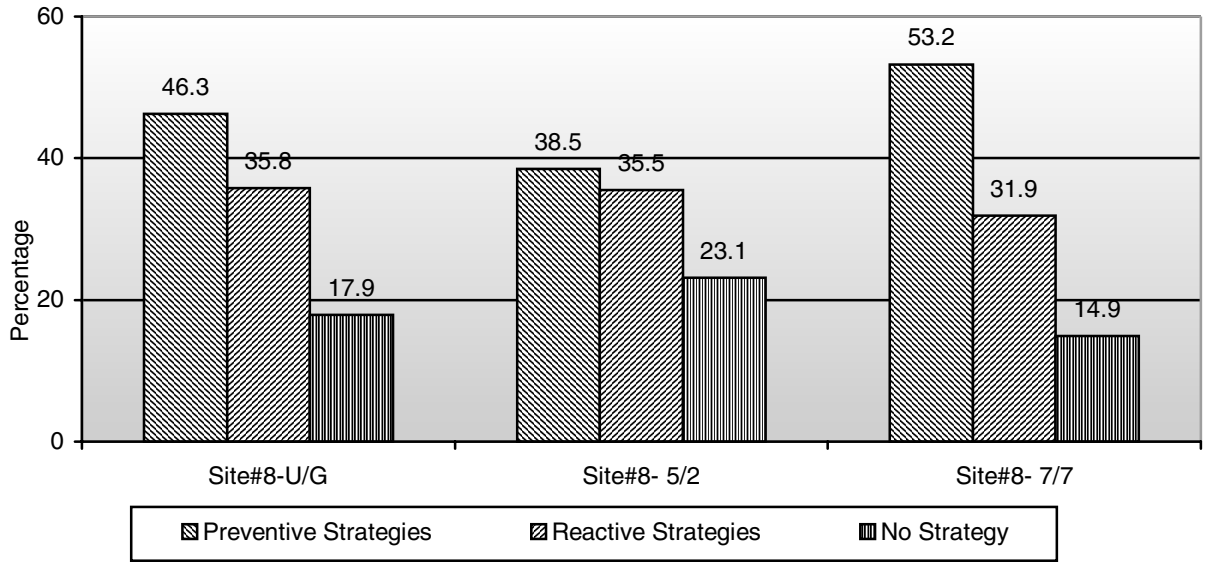


Figure 8 Proportion of people adopting various coping styles, by underground roster groups



contribution of workplace factors and the second regression equation calculated the contribution of personal factors to fatigue-related near-misses at work.

A series of correlations between workplace and personal factors and the experience of a fatigue-related near-miss provided an initial view of the links to fatigue-related risk in the workplace.

In the regression equations, the least significant predictors were eliminated sequentially until only significant predictors remained in each equation.

Standardised beta coefficients for variables that remained significant in the regression equations are listed in Table 4.

The results of the regression equations indicated that personal factors and workplace design factors were equally important in predicting fatigue-related risk at work - both explaining 30 percent of the variance of fatigue risk at work.

Several aspects of the workplace design represent a significant fatigue-related risk for people at the underground operation of site 8, as follows:

- the seven on/seven off roster
- hours at work (time between waking and returning home)
- task rotation (need to practice more task rotation)
- the reluctance to report serious personal fatigue risk
- (links between travel and satisfaction with roster system and fatigue-related near-misses reduced to near zero once attitudinal items and coping items were considered)

In addition, several aspects of individual functioning were linked to the experience of a fatigue-related near-miss. These issues essentially revolve around:

- the ability of the individual to cope with fatigue
- the susceptibility of the individual to the symptoms of fatigue
- the effects of fatigue on personal motivation.

Discussion

The initial study at site 1 provided good evidence that people cope with and respond to fatigue at work in different ways, and that these ways of coping can be linked, in meaningful ways, to different safety outcomes. The early evidence suggested that planning ahead in order to avoid fatigue might play a vital role in successfully coping with fatigue and minimising fatigue risk at work.

The recent studies that asked people to describe their strategy for minimising fatigue risk at work revealed very useful information. The strength of these data lies in the fact that people volunteered the information and that our categorising the comments into preventative, reactive strategies or no strategy seemed to be linked to meaningful differences that reflected quite different ways of thinking about fatigue and its management, and were linked to different safety outcomes. Clearly the no strategy group were more vulnerable to fatigue risk at work, and may suggest that even the reactive strategies have an active component of doing something about fatigue risk.

The coping differences between sites 7, 8 and 9 were used to illustrate the links between individual fatigue management strategies and safety at work that one would expect to find. While these data support these hypothesised links we really have too few sites in the sample to define our results as conclusive evidence.

However, the results really do invite us to think carefully about the role of individual coping, particularly in the light of the lack of differences between the sites on the measures of the distribution of time, sleep and lifestyle. Coping and safety were the only substantial areas of difference across sites. However, it is important to recognise the inherent difficulties of across site comparisons.

It appears that individuals who described a preventative strategy for managing fatigue adopted a more deliberate approach to managing their lives - they slept more hours during the day when working night shift, consumed less alcohol, and reported more family support.

Organising the present in light of the planned future is inherently involved in prevention. Whether the preventative approach is linked to any predispositions remains a question for further investigation. The nuances of the data have suggested to me for some time that locus of control issues may drive much of the differences between these broad approaches to coping with fatigue within roster groups.

It is important to keep in mind the finding in the present study that situational factors were linked to coping responses. At site 8, people working the seven on/seven off roster were more inclined to adopt preventative strategies than people working the permanent day-shift five/two roster. It may be that within work environments where situational demands are relatively low, personality factors are the major determinants of how people cope with fatigue.

In contrast, when the work environment becomes more demanding, these situational factors emerge as the important determinants of how people cope with fatigue. The evidence from site 8 indicated that on the tougher roster, people were more likely to adopt more deliberate and preventative approaches to managing fatigue risk.

The path analysis of site 8 data was used to illustrate the relative contribution of workplace and personal factors to fatigue-related safety at work. As one would expect, the distribution of time at work is an important predictor of safety at work.

Extended hours at work can and do create a serious risk for people in the workplace. The ability to break these hours up with variations in work and a procedure for reporting serious personal fatigue risk seem important modifications to workplace practice at site 8.

But even in an environment that elicits more deliberate coping, a comparison of the standardised beta coefficients suggests that coping plays a more significant role than the roster for predicting susceptibility to fatigue risk at work.

To date our measures of coping have been fairly simple and categorical and therefore not allowed the development of path models using coping style data in our regression models. The development of interval measures (ie scales) of the different styles of coping with fatigue would allow us to gain a more detailed view of the links between coping and safety outcomes.

Table 4

Predictors of a fatigue-related near-miss at site 8 - Underground.

Predictor	r	standardised beta
workplace items (R^2=.30, F=7.4, p<.000)Hours of work		
Hours of work in normal shift	0.17ns	
Longest shift in past month	0.02ns	
Hours of overtime on a tour	0.04ns	
Average hours from waking until arriving home after work	-0.21*	-0.14*
Satisfaction with roster	0.36**	0.22**
Roster worked	-0.23**	-0.14*
(1=5/2, 2=7/7)		
Travel		
Hours of travel from home to work	0.16ns	0.14*
Share driving with others?	0.11ns	
If you travel more than one hour, do you travel immediately before starting work?	-0.01ns	
If you travel more than one hour, do you travel immediately after finishing work?	-0.18ns	
Reporting personal fatigue risk		
Report personal serious fatigue risk to supervisor?	-0.21*	-0.18**
Task rotation		
Do you use task rotation as a way of managing fatigue risk?	-0.27**	-0.22**
How often do you use task rotation?	0.29**	0.16*
Is task rotation helpful?	-0.02ns	
Personal Factors (R^2=.30, F=13.2, p <.000).		
Attitudes		
Fatigue is not really an important issue for people at the NCA project.	0.14ns	
Fatigue is a significant contributor to accidents/injury where I work	-0.29**	
I find coping with fatigue very difficult	-0.41**	-0.25**
I can work and function safely even when I am really tired	0.18*	
How tired I get at work is not the Company's business	0.04ns	
I have developed effective strategies for coping with fatigue	0.19*	
Typical Responses to Fatigue		
I start to feel shaky and/or experience blurred vision	-0.28**	
I make more mistakes and/or find it difficult to make good decisions	-0.26**	
I plan and organise my time so I don't get too tired at work	0.14ns	
I just keep working, but not as safely	-0.25**	
I find ways to keep myself awake and busy	-0.07ns	
I worry more	-0.26**	
I get so tired I don't care any more	-0.36**	-0.17*
I find myself slowing down and being less effective than usual	-0.37**	-0.17*
I have lapses in concentration	-0.30**	
I nod off momentarily	-0.42**	-0.19*
Sleep		
Hours of sleep on day shift	-0.07ns	
Hours of sleep on night shift	0.14ns	
Hours of sleep on days off	-0.21*	
Age and experience		
Age	0.01ns	
Experience with shiftwork	-0.12ns	
Lifestyle		
Do you exercise regularly?	0.01ns	
How would you rate your diet when you are on tour?	0.14ns	
Alcohol consumption, on tour and off tour	0.00ns	
Extent of family support and understanding of work and time away from home	0.01ns	

Note. * p < .05 ** p < .01 ns=not significant

We have plans to use the descriptions of coping strategies gathered in our recent studies to develop measures of each style of coping with fatigue.

Such scales will allow us to examine individually the contribution of some of the individual strategies to effective managing fatigue at work, and to test our initial categorising of the strategies into three broad styles of coping.

Further, such scale measures of each style would allow us to identify the relative strength of the links between each coping style and fatigue risk at work.

The coping literature has also suggested that coping varies with the degree of influence people believe they have over their environment.

Our ongoing conversations with people in fatigue management training sessions have suggested that coping with fatigue might also vary with the degree to which people believe they can influence decisions about their work environment.

Again, whether this belief is driven by situational factors or by personality factors remains to be tested. Locus of control as a personality variable seems an attractive explanation for why people may or may not believe they have some influence over their work environment.

We plan to include these measures of personality in future studies.

The above results have several implications for employees and employers.

Firstly, the results portray those actions that actually contribute to effective fatigue management and suggest that there are some things that individuals can do to cope more effectively with fatigue.

Training programs in fatigue management should describe those methods of effective coping in contrast with the characteristics of ineffective coping.

Secondly, selection procedures could include materials that specifically target individuals who are more or less likely to cope with fatigue.

In those operations where shift-work is a part of the role description, the individual's ability to cope with such rosters and shifts should be an important aspect of selection criteria.

Finally, the results add to the somewhat overwhelming evidence indicating there are some rosters that generate an unacceptable degree of risk for a majority of people, in spite of their best coping efforts.

Conclusion

The above results suggest that it is possible to describe different styles of managing fatigue in the workplace and these ways of coping with fatigue are linked in meaningful ways to different safety outcomes.

Clearly, planning ahead and organising one's life plays a critical role in effective fatigue management. We have evidence supporting the view that these differences in coping style might be linked to both situational and dispositional factors.

We have interpreted our data as indicating that individual coping plays a relatively dominant role in managing fatigue risk at work.

While the demands of rigorous work environments elicit more deliberate coping strategies, this improved coping may not eliminate the degree of fatigue risk involved in those rigorous workplaces.

There is clearly more work to be done in clarifying the role of the individual in managing fatigue risk at work.

There appears to be some ways of coping that are more effective than others and situational factors seem involved in eliciting variations in coping.

We have yet to clarify the links between stable personality factors and coping variations and to learn how these variations might be influential in different workplace conditions.

There is also a very important set of questions about implications for training and behaviour change that need to be addressed in order for us to engineer a safer workplace.

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