

# **Fatigue risk: The roles of napping, depression and alcohol**

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## **Abstract**

The present paper continues an exploration of the role of the individual in adding to or reducing fatigue risk within mining operations (see Strahan, 2002, 2003). Results are reported from three survey based investigations conducted during 2008 and early 2009 in two open-cut and one underground operation. The results indicate that (a) depression is a significant issue and linked to fatigue risk; (b) excessive alcohol consumption is linked to increased fatigue risk; and (c), napping is symptomatic of poor and inadequate sleep and poor coping rather than an effective or sustainable fatigue management strategy. The results are discussed in the context of the need for a frame of reference that extends beyond roster design and shift length when considering not only the predictors of fatigue risk, but also the most effective strategies for controlling fatigue risk.

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## Introduction

It is generally argued that both workplace design factors and individual factors contribute to the fatigue risk of employees in the Australian mining industry. It is likely that these two sets of factors are not discreet but interact to bring about increased fatigue risk. The present study continues a focus on the role of individual differences in fatigue risk (see Strahan, 2002, 2003, 2003b, 2004, 2004b) with a specific focus on napping as a way of managing fatigue, alcohol consumption, and depression and their respective links to fatigue risk.

### Level of demand

It is a working assumption that the mining industry requires a continuous operation arrangement that involves night shift. Extended shifts and rosters seem par for the course across the industry. Only a few operations persist with permanent 8-hour shift arrangements. Further, the hours of work per week in the mining industry are well above national average. For example, in 2005 average hours per week for full time Australian workers was calculated at 34.7, whereas the mining industry recorded an average of 45.5 hours/week, up from 43.2 hours/week in 1995 (ABS, 2006). These arrangements bring an inevitable additional demand to all employees in the industry. Add remote locations and relatively tough conditions to the roster and hours of work arrangements, and few people would disagree that the mining industry brings an additional level of demand to employees. It would seem inevitable that how people go about coping in these high demand conditions might have a direct bearing on their well being and the degree of risk they experience as a result of functioning within a high demand environment.

### Coping strategies

In 2002 we demonstrated that an individual's strategy for coping with fatigue had a direct link to the outcomes they experienced in terms of fatigue risk and hours and quality of sleep (see Strahan, 2002, 2003). In fact, data collected in 2003 demonstrated commonalities between the way an individual coped at work and the strategies adopted for coping with the tension shift work brought to family life. A second study in 2003 revealed that the extent to which individuals assumed a sense of personal ownership and agency within the workplace was linked to their reported level of fatigue risk and injury history (see Strahan, 2003, 2003b).

The 2002 study identified three quite different styles of coping with the demand of fatigue among mining employees. These styles were labelled as the *Preventive* approach, the *Reactive* approach and the *Do Nothing* approach. The Preventive approach was defined by an active and planned approach aimed at preventing fatigue risk. People who adopted a preventive approach agreed that they planned their sleep, exercise and diet, they reported more hours of sleep and scored lower on two measures of sleep quality and reported fewer near misses that they believe were caused by personal fatigue. In contrast, the Reactive approach was defined by an absence of planning and thinking ahead and a reliance on stimulation seeking strategies when an individual felt fatigued, eg. caffeinated drinks, winding down windows, turning up radios, splashing water on face, etc. The relatively small group adopting the Do Nothing approach indicated that they did nothing to manage fatigue, but were most likely to report one or more near misses as a result of personal fatigue, were more likely to see their personal fatigue as caused by a range of external conditions, reported poorer sleep quality, fewer hours of sleep, consumed more alcohol on days off and were more likely to report distancing strategies at home as a way of managing the family tensions they believed were created by shiftwork (see Strahan, 2002, 2003a). These findings are consistent with Smith *et al* (2007) who found health service workers whose approach to managing fatigue reflected an internal locus of control fared better during shift and adopted more active strategies for coping with shiftwork. The Preventive approach to coping with work arrangements parallels Smith's description of an internal locus of control.

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## Napping as a fatigue management strategy

Napping on shift has been suggested as a potential strategy for managing fatigue risk within the workplace. For example, a number of studies demonstrate the effectiveness of naps to improve subsequent performance and alertness among pilots on long-haul flights and in laboratory studies (Lovato *et al*, 2009; Rosekind *et al*, 1995; Signal *et al*, 2009).

However, there are several arguments against napping as a fatigue management strategy. An initial argument comes from an understanding of sleep physiology and points out that waking from sleep inevitably has a period of sleep inertia that involves diminished cognitive function (Dinges *et al*, 1989; Lovato *et al*, 2009). In addition, sleep outside of regular sleep periods can interfere with sleep quality during the major sleep period (Akerstedt, *et al*, 1989). A second argument distinguishes between responding to a one-off crisis event and a regular management strategy. The argument goes that a short nap is obviously a preferred solution if it avoids a crisis but may not be useful as a regular strategy. This position accepts the value of a nap instead of a crisis, but points out that it might be more useful to examine why there is a need for a regular nap during regular working hours.

It is hard to avoid the logic that a nap is better than a crisis and few would seriously argue with that position. The contentious aspect of the napping debate has its focus squarely on the extent to which napping should be institutionalised as a regular strategy during work hours. It is also hard to avoid the observation that the napping strategy has a focus on the symptoms of fatigue rather than the underlying causes of fatigue. The present study sought to examine the correlates between napping as a strategy to manage fatigue and fatigue risk in a regular working environment, and to identify possible precedents of napping.

## Alcohol / depression

In the clinical research literature the link between excessive alcohol use and the experience of depression has been established for some time. There is some consideration of the direction of causality, whether people who are depressed drink excessively as a form of self medication, or excessive alcohol has a causal effect on depression. That the two conditions seem to frequently go together is hardly questioned. Further, the links between depression and shift-work are also reasonably well established. People working shiftwork are known to experience higher rates of depressive episodes. For example, Geiger-Brown (2004) surveyed 473 female nursing assistants to find that working two or more double-shifts per month was associated with increased risk for all mental health indicators, and working 6-7 days per week was associated with depression and somatisation. Further, the likelihood of depression was increased four-fold when working 50+ hours/week, more than two weekends/month and more than two double shifts/month.

In a number of our previous studies aimed at identifying the predictors of fatigue risk, excessive use of alcohol on days off has emerged as a significant predictor of fatigue risk at work. Generally, respondents report little alcohol consumption before a night shift and only a little more after a day shift, but the rate of consumption typically climbs dramatically on days off. In previous studies we have typically subtracted the average consumption after a day shift from the average consumption on days off and referred to this difference as “binge drinking”. This measure has been more predictive of fatigue related risk on rostered days than simply the amount of alcohol consumed on days off. We have also found styles of coping with fatigue and personal agency linked to our measure of binge drinking. In several studies, individuals reporting a preventive style of coping and increased personal agency tend to have less divergence between their days on and days off consumption of alcohol. We have typically interpreted these findings as indicative of self-regulation, as opposed to reliance on external regulation. In contrast, individuals reporting a reactive approach to managing fatigue or who make no effort to manage fatigue typically report a greater difference between consumption on rostered days and on days off. Again, we have interpreted these repeated findings in terms of the dependence on external sources (mine site alcohol testing program) for the regulation of alcohol consumption.

The present study aimed to extend our understanding of the role of individual differences in predicting fatigue risk with a particular focus on understanding the role of napping, as it is currently practiced, in either preventing or being linked to fatigue risk. The study also aimed to investigate the rates of depression and alcohol consumption and how these individual differences might be linked to fatigue risk.

## Method

### Participants

Results from three samples are reported in the present paper. These samples were taken during 2008 and early 2009 from two open cut coal mines in Central Queensland and one underground coal mining operation in New South Wales. Table 1 below outlines the characteristics of the three samples. The aim at each site was to include all site personnel in the study, and in general we achieved over an 80% response rate. The three samples comprised a total of 581 respondents.

Table 1  
*Descriptive statistics for each sample.*

Sample	Operation	N	Age range	Roster type
#1	QLD O/C Coal	164	40% > 40 years	4 panel, 7/7
#2	QLD O/C Coal	244	47% > 40 years	Mixed rotating rosters with pyjama day
#3	NSW U/g Coal	173	50% > 40 years	Permanent day, afternoon and night 8 hr shifts*
TOTAL =		581		

*Note.* The permanent 8-hour shifts were organised around a seniority principle which meant that the majority of new starters at the mine worked a permanent night shift.

### Instruments

The 5-page questionnaire was relatively consistent across sites with only minor variations to accommodate site specific needs in relation to roster design, work areas, and living arrangements.

*Napping.* In the second sample, participants responded to a single item “Do you use naps at crib time as a way of managing fatigue at work?” on a 4-point Likert scale where 1 = never to 4 = consistently. In the third sample participants responded on the same 4-point Likert scale to the single item “Do you use naps (ie. at crib time or when travelling to the panel) as a way of managing fatigue at work?”

*Depression.* The Centre for Epidemiological Studies-Depression Scale (CES-D) is a 20-item self-report checklist scale designed to measure depressive symptoms in the general population. Responses are recorded on a 4-point Likert scale where 0 = none of the time or rarely (1 day in 7), through to 3 = most of the time (5-7 days in 7). Radloff (1991) reported very good internal consistency and adequate test-retest reliability for the scale. Validity has been established with high correlations with other measures of depression, by correlations with clinical ratings of depression, and discrimination between clinical and non-clinical groups. Internal consistency checks from the three samples returned Cronbach's alpha ranging from .81 to .84. Possible raw scores on the CES-D range from 0-60.

Radloff's early general population (ie. mixed gender) samples reported mean scores of 7.9 to 9.3 (SD=7.5-8.5) while her clinical sample of psychiatric patients reported a mean score of 24.4. She initially suggested a cutoff score of  $\geq 16$  for identifying elevated levels of depressive symptoms and found 15-20% of her samples in that category. Some years later she suggested a cutoff score of  $\geq 23$  for identifying Major Depressive Disorder (Radloff & Locke, 1986).

*Alcohol consumption.* Participants responded to two or three (dependent on roster) items assessing average alcohol consumption in standard drinks/day for variations in shift. For example, “On average, how much alcohol do you consume on rostered days?” The questionnaires for the two samples where rotating rosters were in place included three items identifying “after day shift”,

“before night shift”, and “on days off”. The questionnaire for the 8-hour permanent shift operation included the options “rostered shifts” and “days off”.

Alcohol consumption was categorised into levels of risk consistent with the National Health and Medical Research Council guidelines for alcohol consumption (NHMRC, 2001). In addition, a measure of “binge drinking” was calculated by subtracting the average consumption on rostered shifts or day shifts from the “days off” average consumption.

**Fatigue Risk.** In each sample the *Index of Fatigue Risk* represented the factor scores saved from a single factor solution of the following items:

1. Over the last month of your work, have you personally had a “near miss” which you believe was caused by fatigue?
2. If, Yes, how many?
3. How many shifts in last week did you feel unable to work safely because of fatigue?
4. Do you ever get so tired it affects your ability to work safely?

In addition to the featured measures above, the questionnaire contained a range of additional measures described in Table 2 below.

Table 2

*Additional measures of the Fatigue Questionnaire.*

Measure	Description
Sleep Index	8-item measure assessing quality of sleep, high scores indicate poor sleep
Epworth Sleepiness Scale	Screening measure for sleep disorders, Johns (1991, 1992)
Personal Responsibility for Safety	12-item measure assessing the extent an individual accepts an ownership of personal safety or alternatively externalises that responsibility.
Coping Style	Participants rate three unmarked paragraph descriptions of <i>Preventive</i> , <i>Reactive</i> , and <i>No Strategy</i> approaches to fatigue management on a 7-point Liker Scale.
Accountability	8 item measure of organisational culture. Items describe role clarity, regular feedback, real consequences for violation of procedures.
Family support	To what extent does your immediate family support you and understand your work? rated on a 4-point Likert scale.
Impact on Family	What impact does your work and roster arrangements have on your family and family life? Rated on a 4-point Likert scale.
Satisfaction with roster	“All things considered, how satisfied are you with your current roster system - in terms of fatigue management? Rated on 4-point scale, 1=very dissatisfied, 4= very satisfied.

## Procedure

The study at each of the sites was part of an overall strategy for developing or reviewing fitness for work procedures. Results from the studies were discussed in educational sessions scheduled for all employees at each of the sites. Copies of the complete report were also available to employees. The method to collect data was consistent across the three sites. Senior managers and/or safety personnel provided a brief presentation describing the purpose and scope of the study to employees at a regular pre-shift meeting and employees completed questionnaires at that time. All surveys were anonymous and returned to a sealed box.

## Results

The results below are firstly presented by topic and then a series of correlations and regression equations brings integration to the findings.

### Fatigue Risk

Within the two open cut operations, 4.9% and 5% of respondents reported a fatigue related near miss in the previous month’s work, whereas in the U/G operation 22.7% of respondents reported a near miss they believe was caused by fatigue. Further examination of #3 sample revealed quite dramatic differences between the shift groups at this operation, see Figure 1 below. Over half of

the permanent night shift workers reported a near miss from fatigue in the last month of their work, compared to 11% and 14% of the day and afternoon shifts.

In each sample the items comprising the Index of Fatigue Risk loaded on a single factor and factor scores saved to the data file to represent the Index of Fatigue Risk.

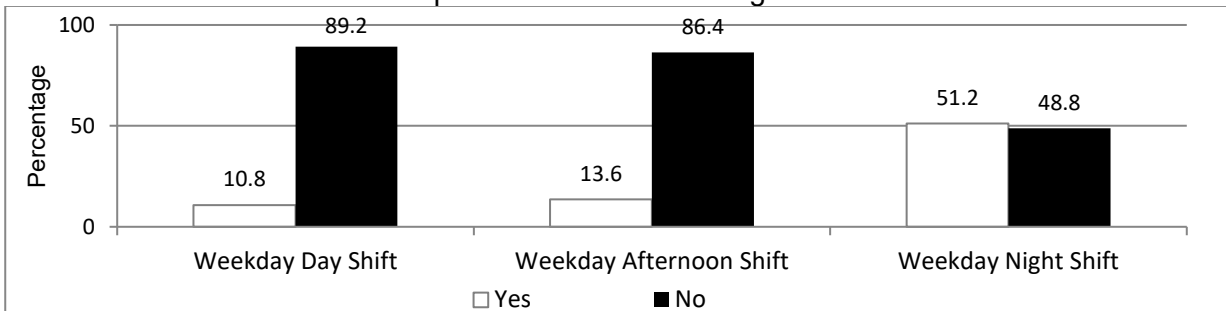


Figure 1. Proportion of sample #3 reporting a fatigue related near miss in previous month of work by shift.

### Napping

Only Samples #2 and #3 responded to items on napping as a way of managing fatigue. Figure 2 below presents the proportion of respondents from each site reporting using napping at crib time as a strategy for managing fatigue. Respondents from the underground operation were more inclined to use napping as a way of managing fatigue. Figure 3 below presents the significant differences between shift groups at #3 sample ( $X^2=26.8$ ,  $p < .01$ ).

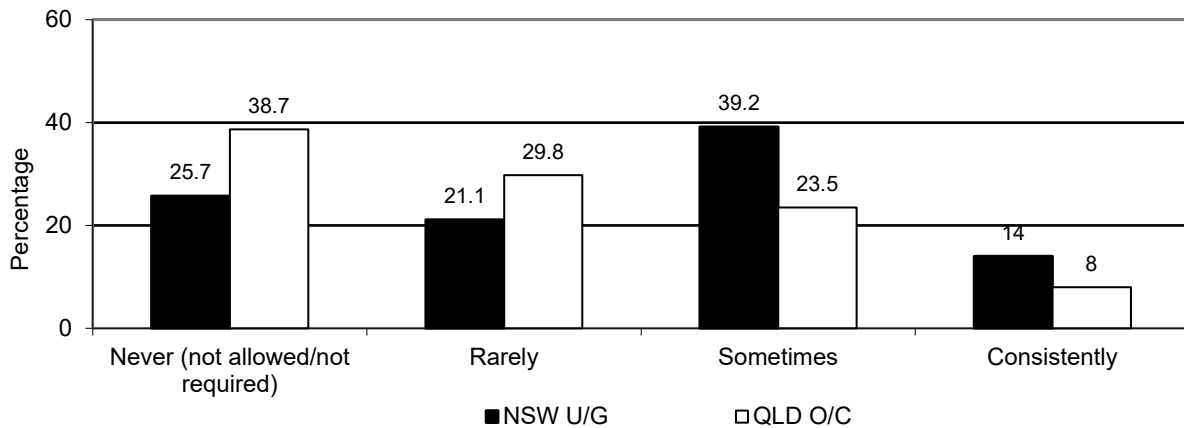


Figure 2. Proportion of respondents using naps at crib time as a way of managing fatigue.

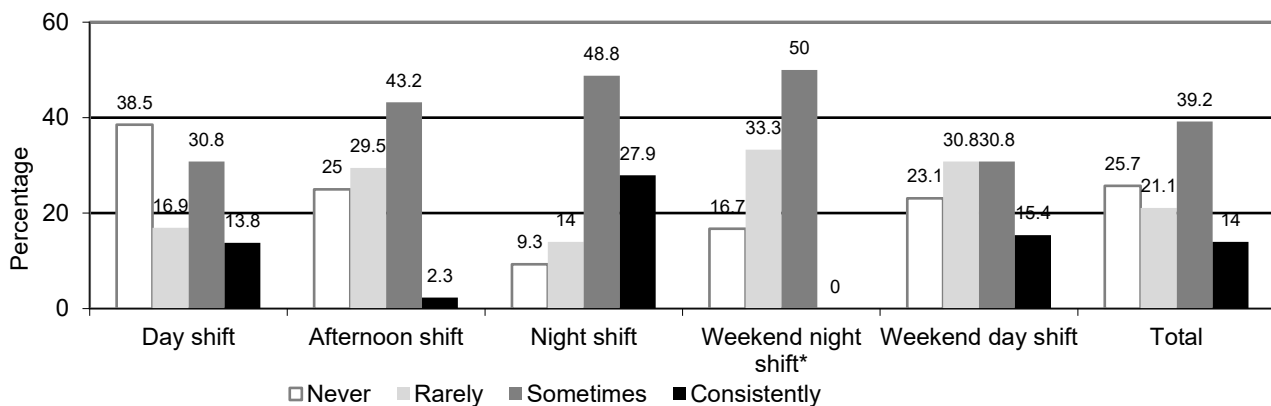


Figure 3. Proportion of respondents who indicated they used naps as a way of managing fatigue by shift.

\* Note. Only 6 respondents listed themselves as weekend night shift.

Table 3 below presents results from #3 sample revealing correlations between ratings on the napping item and other measures in the questionnaire. The use of napping as a way of managing

fatigue was significantly linked to increased fatigue risk, poor sleep and less hours of sleep after a regular shift, reactive coping as opposed to preventive coping, less satisfaction with roster arrangements and increased symptoms of depression.

Table 3  
Correlates of using naps as a way of managing fatigue – sample #3.

Measures	r
“I find coping with fatigue difficult”	.48**
Fatigue risk	.47**
Sleep Index	.45**
Coping Style – Reactive	.31**
Accountability	-.30**
Satisfaction with roster	-.26**
Hours of sleep after regular shift	-.25**
Coping Style - Preventive	-.25**
Depression	.23**
Epworth Sleepiness Scale	.20**

Note. \* p < .05 \*\* p < .01

### Depression

Figure 4 below presents results from the three samples showing the proportion of respondents in various categories on the CES-D scale. In addition, Figure 4 presents the distribution of Radloff’s normative and psychiatric sample (Radloff & Locke, 1986). The proportion of respondents in each sample reporting elevated or serious symptoms of fatigue ranged from 23.7% to 27.4%.

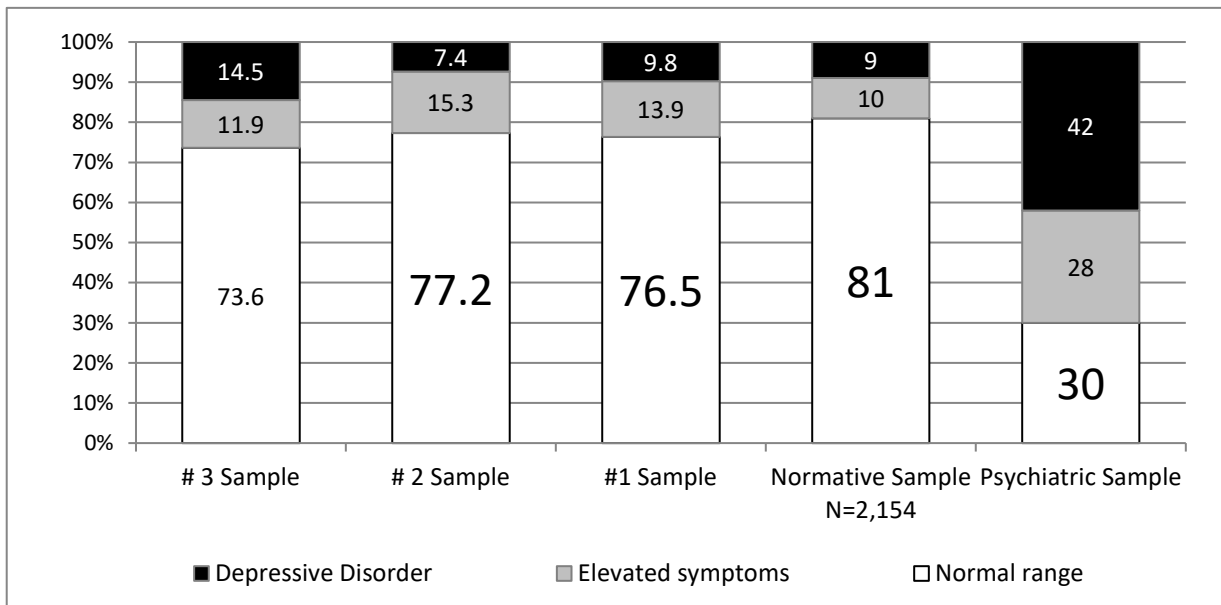


Figure 4. Proportion of samples falling into normal range and clinical range on the CES-D.

Note. Elevated symptoms = scores from 16-22; Depressive disorder = scores ≥ 23, following Radloff & Locke (1986).

Table 4 below presents the results from a series of correlations identifying the significant correlates of depressive symptoms across the three sites. Depressive symptoms were most strongly linked to the measures of poor sleep, fatigue risk, family support, and a cluster of variables representing effective or ineffective coping. It is worth noting the significant links between depression and Accountability suggesting that the organisational context (clarity about roles and expectation, and regular feedback) one works within may contribute to individual depressive symptoms. Alternatively, the individual experience of depression may influence ratings of organisational culture.

Table 4  
Correlates of depressive symptoms - sample #3.

Measures	Sample #1	Sample #2	Sample#3
Sleep Index	.41**	.47**	.55**
Epworth Sleepiness Scale	.21*	.40**	.24**
Fatigue risk	.23**	.16*	.52**
Personal responsibility for safety	-.18*	-.45**	-.37**
Family support	-.28**	-.29**	-.32**
Organisational Accountability	-.33**	-.25**	-.17*
Coping style - Preventive	-.21*	-.25**	-.26**
Coping style - Reactive	.19*	.18*	.20*
Use of naps as a way of managing fatigue	—	.20**	.23**
Satisfaction with roster	-.03	-.10	-.36**
Hours of sleep after regular shift	-.10	-.19*	-.30**

Note. \* < .05    \*\* p < .01

Alcohol consumption

Figure 5 below presents the proportion of respondents from the three sites reporting alcohol consumption at hazardous or dangerous levels (according to the National Health and Medical Research Council guidelines, 2001) by type of shift and days off. As a general rule, alcohol consumption increased dramatically on days off.

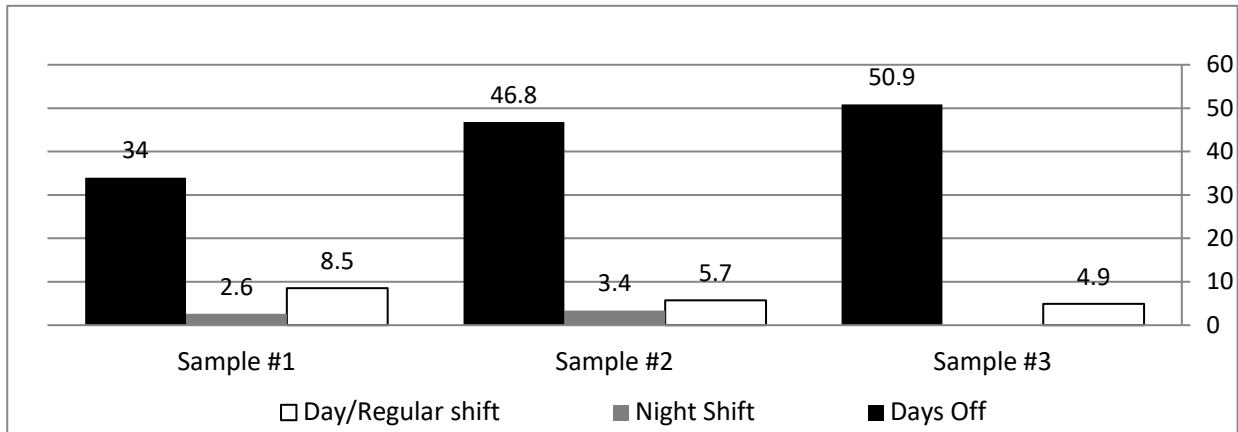


Figure 5. Proportion of respondents from the three sites drinking at hazardous or dangerous level by shift.

Similar to the variations across sites in proportion of people drinking excessively on days off, a series of correlations revealed variations between the sites in the correlates of alcohol consumption. For example, at site #1 the consumption on days off was comparatively contained, but the proportion of people drinking excessively after a day shift was marginally higher, consumption after day shift was weakly linked to less effective coping. At site #2, excessive consumption on days off was linked to youth and inexperience with shiftwork as well as weak links with ineffective coping. There was a weak link between binge drinking and symptoms of depression in the second sample. At site #3 there were moderate links between “binge drinking” and youth and inexperience with shiftwork, and a weak link to limited responsibility for personal safety.



Table 5  
Correlates of alcohol consumption across the three sites.

Variable	#1 sample regular shift	#2 sample "binge"	#3 sample "binge"
Fatigue risk	-.08	.09	.18*
Age	-.16	-.39**	-.41**
Years working shiftwork	-.06	-.28**	-.32**
Personal responsibility for safety	-.18*	-.17*	-.21**
Preventive Coping	-.09	-.16*	-.03
Reactive Coping	.05	.15*	.08
No strategy	.21**	.24**	.06
Depression	.10	.16*	.07

Note. \* p < .05 \*\* p < .01

Predicting fatigue risk

In order to provide an integrated sense of the unique contribution of each variable to fatigue risk a predictive model was developed using multiple regression analyses. Table 6 below presents a list of individual and workplace factors significantly linked to fatigue risk. Figure 6 below presents the results from a stepwise regression analysis where the significant correlates of fatigue risk were entered into an equation and eliminated as they failed to explain unique variance in fatigue risk. Sample #3 was used in this analysis as it afforded an examination of the role of various shifts in predicting fatigue risk.

Table 6  
Workplace and individual factors correlating significantly with Fatigue Risk – sample #3.

Individual factors	r	Workplace factors	r
Sleep Index	.56**	Working night shift	.37**
Hours of sleep after regular shift	-.52**	Do you have adequate breaks (Yes=/ No=2)	.32**
Depression Scale	.52**	Hours from waking before shift to home after shift	.22**
Use naps at crib time or travel time to panel	.47**	Working day shift	-.21**
Satisfaction with roster	-.42**	Employee status (Employee=1/Contractor=2)	-.18
Coping style - Reactive	.34**	Appropriate supervisor support (Yes=1/No=2)	.17*
Coping style – Preventive	-.33**		
Epworth Sleepiness Scale	.33**		
Impact of work arrangements on family life	.32**		
Sleep difference	.31**		
Personal responsibility for safety	-.27**		
Family support for work arrangements	-.24**		
Hours of sleep on days off	-.22**		
Alcohol consumed on days off	.21**		
Diet	-.18*		
Accountability in the business	-.18*		
Binge drinking	.18*		

Note. \* p < .05 \*\* p < .01

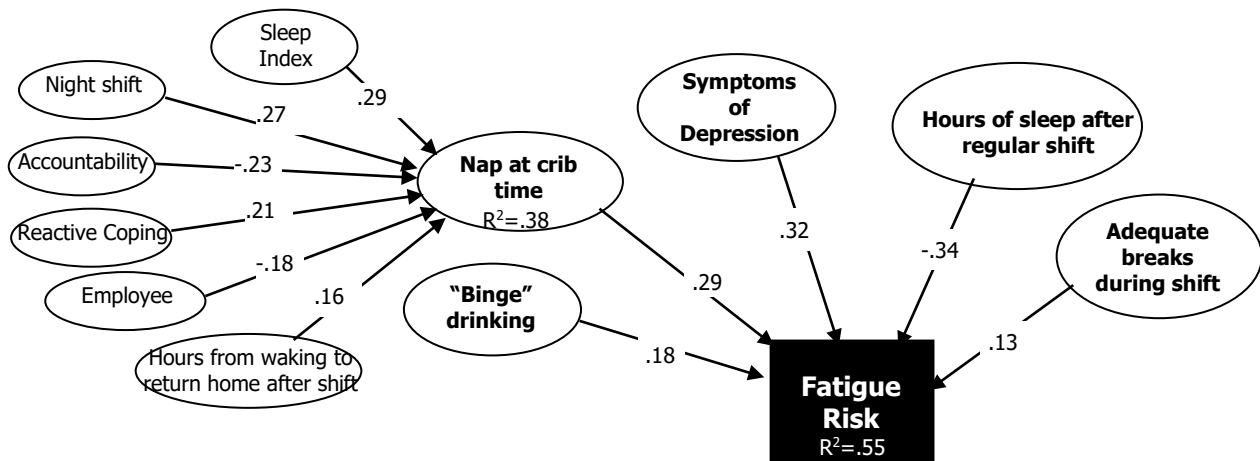


Figure 6. Path model showing direct and indirect linkages to fatigue risk.

When the overlap between variables was accounted for only five predictors emerged from the stepwise regression explaining 55% of fatigue risk at site #3. Clearly the strongest contribution to fatigue risk was made by inadequate sleep, symptoms of depression and napping at crib time. These results do not indicate that the other correlates of fatigue risk are not important, the stepwise regression analysis simply reveals that the contribution to fatigue risk from the significant correlates was mediated via these five variables (see Baron & Kenny, 1986). For example, a second regression equation identified six significant predictors of napping at crib time and explained 38% of the variance. Hence, reactive coping has an indirect effect on fatigue risk, via the practice of napping at crib time. Poor sleep, working night shift, reporting that there was little individual accountability in the business and reactive coping were the major contributors to napping at crib time, and indirectly contributed to fatigue risk. Regression equations were not developed to identify secondary predictors behind the other four primary predictors of fatigue risk.

## Discussion

It is important to recognise that the present study was carried out at mining operations where there were no formal provisions for napping at crib time, but clearly tacit permission was afforded to night shift workers at the NSW underground operation. Napping at crib time was more closely aligned with the symptoms of not coping effectively with fatigue as is evident in the regression results. In this sense, napping at crib time in sample #3 could be used as an indicator of ineffective coping with the inherent demand of the job. Individuals reporting napping at crib time also reported increased fatigue risk, poorer quality of sleep, more sleep problems, and less hours of sleep after a regular – hence the need to nap at crib time. It seems napping at crib time is unlikely to be an effective substitute for adequate sleep during non-work time and a more considered approach to managing the demands of shiftwork. It seems more likely that regular napping signals a more serious sleep or mood regulation difficulty generating the need for napping.

The results from previous controlled studies linking napping to increased alertness should not be overlooked, but as it is commonly practised in these sites, it seems that napping at crib time is more of an indicator of sleep debt coming into shift than effective coping strategies. These results do not rule out the value of a nap at crib time, or the obvious fact that a nap at crib time is better than a fatigue-related incident. These results do, however, suggest that there is some benefit on maintaining the focus on the pre-cursors to napping at crib time and the priority of the primary sleep period.

Secondly, it is important to think through the implications of the proportion of the three samples reporting serious symptoms of depression and the links between depressive symptoms, poor sleep and fatigue risk. The results show no evidence that the industry is significantly different from the broader Australian society where rates of male depression are regarded as a significant challenge. The link between symptoms of depression, poor quality sleep and fatigue risk warrant consideration and are consistent with the findings from studies on burnout in demanding organisations (Vishwanath, 1998). Our own experience in providing individual feedback from 360° leadership measures is that approximately 1 in 20 individuals are seriously depressed and referred to their medical practitioners for treatment for depression. Further, it is our experience that frequently individuals experiencing depression are understood in terms of poor work performance rather than understood within the context of a treatable medical condition.

Thirdly, the results reveal a quite dramatic increase in alcohol consumption on days off. Clearly, younger and more inexperienced employees are more inclined to drink heavily on days off. It is worth noting that “binge” drinking as defined in this study is a direct predictor of fatigue risk in the #3 sample as it has been in other samples. Where there is less binge drinking and a more experienced workforce alcohol seems to play a less significant role in contributing to fatigue risk – eg. sample #1. The results also suggest that while the industry has for the most part eliminated alcohol intoxication from site, the current controls may not have significantly influenced off-site binge drinking, the effects of which can be expressed in increased fatigue risk on site.

The final set of integrative analyses revealed that fatigue risk was contributed to by a range of individual and workplace design factors. Clearly poor and inadequate sleep remains the major contributor to fatigue risk, closely followed by symptoms of depression. Working night shift emerged as the most significant workplace design factor as well as reports of inadequate breaks, and the time from waking before shift to returning home after shift. The emergence of night shift as a predictor of fatigue risk is not a surprising finding. The duration from waking before shift to return home after shift was correlated with fatigue risk and predictive of increased napping at crib time. In several of our studies we have found an increased duration between the time of waking before shift and the commencement of shift increases the number of hours from waking to return home after shift and this in turn has an impact on hours of sleep and quality of sleep, levels of duress and fatigue risk. Night shift people, particularly those inexperienced with night shift, seem most likely to wake well before start of shift and thus extend the window of time from waking before shift to arriving home after shift. Studies of cognitive function demonstrate there is a limited time (perhaps 15-17 hours assuming adequate sleep) from waking until cognitive function is significantly diminished (Dawson & McCulloch, 2005).

The present study set out to broaden our understanding of the role of the individual differences within the context of the complex interactions between workplace design and individual factors in predicting fatigue risk. While the studies described above carry the restrictions of all self-report studies, the results are consistent with the broader research literature. There is little question that the mining industry is a high demand environment, and the results reported above suggest that participants in the industry experience a significant degree of duress and are not exempt from poor sleep and symptoms of depression. Further, the results suggest that these vulnerabilities interact with ineffective coping to expose individuals to increased fatigue risk.

The results also demonstrate that the challenges of fatigue management are clearly bigger than roster design and debates about shift length (Strahan, 2004, 2004b). While these factors may contribute to the level of demand inherent in the industry, the pragmatics of commerce and industry are unlikely to see dramatic shifts away from 12-hour shifts and remote locations. Inevitably there is an optimal trade off between the level of demand inherent in workplace design and the capability of a majority of individuals to cope effectively under those conditions. If the industry is going to maintain its increased hours of work it is necessary that individuals in the industry develop the strategies to cope with that level of demand. The alternative is the level of risk evident in the above results that can by no means be seen as unusual.

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