The role of workload and driver coping styles in predicting bus drivers' need for recovery, positive and negative affect, and physical symptoms

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ABSTRACT

A survey was conducted on a sample of 159 Australian bus drivers to determine the extent to which workload and self-reported driver coping styles predicted their subjective health status. The model that was proposed incorporated the hours spent driving as a measure of workload, both adaptive and maladaptive driver coping styles, and self-report measures of need for recovery (i.e., fatigue), positive and negative affect, and physical symptoms. Results of hierarchical regression analyses revealed that the workload was a significant predictor of drivers' need for recovery but not of their positive and negative affect nor of their physical symptoms. Need for recovery was in turn a significant predictor of positive and negative affect and of their physical symptoms indicating that it mediates the influence of workload on positive and negative affect and physical symptoms. Two maladaptive coping strategies added to the prediction of need for recovery, as well as to the prediction of negative affect, even after controlling for the influence of need for recovery. One adaptive coping strategy added to the prediction of positive affect. Strategies for management of fatigue in bus drivers should focus on the assessment and remediation of maladaptive coping strategies which impact of drivers' need for recovery which in turn predicts positive and negative affect and physical symptoms.

Keywords: Bus Drivers, Adaptive Coping, Maladaptive Coping, Need for Recovery, Positive Affect, Negative Affect, Physical Symptoms

Research indicates that bus driving is a stressful occupation associated with increased health risks. For example, epidemiological studies have found that, compared to other occupations, bus drivers are at higher risk of cardiovascular, gastrointestinal, and musculoskeletal problems (Winkleby, Ragland, Fisher, & Syme, 1988). There is also evidence of relatively high blood pressure levels (e.g., Evans, Johansson, & Rydstedt, 1999) and elevated levels of stress-related hormones (e.g., adrenaline, cortisol) among bus drivers during work (Aronsson & Rissler, 1998; Carrere, Evans, Palsane, & Rivas, 1991). Furthermore, Duffy and McGoldrick (1990) found that, compared to normative samples, bus drivers had lower levels of job satisfaction and unfavourable scores on mental health indices due to their work-related stressors.

Bus driving is an occupation characterised by both high and conflicting demands (Carrere et al., 1991; Meijman & Kompier, 1998). For example, the demand for professional and courteous customer service often conflicts with the need to keep to tight time schedules and safely operate the bus (Meijman & Kompier). However, the way that bus drivers cope with the demands of their job can exert a strong influence on their health and well-being. For example, Meijman and Kompier found that bus drivers who placed adherence to time demands above demands for safe driving suffered more psychosomatic symptoms, musculoskeletal problems, and tension at the end of the work day than those for whom safety was a priority. In a study of Australian coach drivers, Raggatt (1991) found that long driving hours and passenger complaints predicted maladaptive coping behaviours (e.g., speeding and stimulant use), which in turn, predicted stress symptoms (e.g., health complaints, fatigue, job dissatisfaction).

Eriksen and Ursin (1999) discovered that, for workers in a Norwegian postal service, the individual coping mechanisms were a more important determinant of subjective health outcomes than organisational factors. This study will examine the degree to which the level of demands that drivers encounter, and the adaptive and maladaptive driver coping strategies that drivers report using are able to predict measures of their health and well-being. The relative importance of the different coping variables in explaining variance in health status will indicate which of those strategies should be considered in the development of stress and fatigue management interventions for bus and coach drivers. The following theoretical model will suggest that work demands may be an indirect predictor of health status and performance, with drivers' coping styles mediating the relationship between work demands, and well-being. Only the component of the model relating to health status will be examined in this study.

A Theoretical Framework Explaining the Role of Coping in Driver Stress Research

Matthews and colleagues (e.g., Matthews, 2001, 2002; Matthews, Desmond, Joyner, Carcary, & Gilliland, 1996; Matthews, Dorn, & Glendon, 1991; Matthews et al., 1998; Matthews, Emo, & Funke, 2005; Matthews, Tsuda, Xin, & Ozeki, 1999) have carried out extensive research on driver stress. Their research established links between environmental stressors (e.g., traffic jams), driver coping styles, personality traits associated with vulnerability to driver stress, measures of strain and fatigue, and performance decrements.

Matthews et al. (1996) identified five coping styles applicable to driving: confrontive coping, task-focused coping, emotion-focused coping, reappraisal, and avoidance. Confrontive coping strategies involve antagonising other drivers or risk-taking and are therefore potentially dangerous (Matthews, 2001). Task-focused strategies are safety-enhancing because they involve coping efforts related to driving safely (Matthews et al.). Emotion-focused coping represents

strategies of self-criticism and worry, which may cause cognitive interference and distract the driver (Matthews et al.). Avoidance may also be associated with reduced attention to task, whilst reappraisal may be more adaptive because it is associated with positive cognitions of the driving experience (Matthews et al.).

Matthews et al.'s (1996) research suggested that confrontive and emotion-focused coping were maladaptive coping styles associated with more negative outcomes. For example, Matthews et al. found that confrontive coping is linked to violations, errors, and loss of safety. They also found that emotion-focused strategies such as self-criticism have the potential to distract the driver. Based on the research reviewed, task-focused coping and reappraisal responses appear to be the most adaptive while confrontive and emotion-focused coping styles appear to be the most maladaptive.

Matthews (2001) also developed a detailed framework for driver stress research based on the transactional approach. Matthew's transactional model incorporated: stressors specific to the driving environment (e.g., bad weather and traffic jams); cognitive stress processes (appraisal and coping) that may generate stress outcomes or symptoms; personality traits associated with vulnerability to driver stress, such as aggression and dislike of driving; and subjective stress outcomes or symptoms, such as performance decrement, tension, tiredness, or worry (see Matthews, 2001, p. 136 for the diagrammatic model). Matthews proposed that the cognitive processes of appraisal and coping should mediate personality and environmental effects on stress outcomes. Gulian, Matthews, Glendon, Davies, and Debney (1989) suggested that driver stress may arise from cognitive appraisals that the demands of the driving task are taxing or exceeding the individual's capabilities and coping resources. According to Matthews, appraisal and coping depend on both situational and personal factors. Situational influences on task demands include physical factors (e.g., bad weather, poor visibility), social factors (e.g., threats from other drivers), and factors extrinsic to the driving task (e.g., time urgency).

While Matthews' transactional framework for driver stress has been used to explain the determinants of stress and fatigue in normal drivers, it had yet to be applied to specific groups of drivers such as bus drivers. Therefore, the transactional model of driver stress was used in the present study as the basis for the prediction that drivers who typically use more adaptive coping strategies and fewer maladaptive coping strategies would experience less need for recovery, greater positive affect, less negative affect, and fewer physical symptoms. This set of predictions is portrayed in Figure 1. In particular, we predict that need for recovery will play a mediating role in explaining the influence of work demands on drivers' physical health and emotional well-being, with drivers' coping styles explaining additional variance in all outcome variables.

Insert Figure 1 About Here

Drivers' Need for Recovery, Positive and Negative Affect and Physical Symptoms

The outcome measures used in this study focused on need for recovery at the end of the day, job-related positive and negative affect, and physical symptoms. The importance of each of these will now be discussed.

Sluiter, van der Beek, and Frings-Dresen (1999) suggested that fatigue is a short-term adverse reaction to exposure to occupational risk factors. They portrayed the relationships between work demands and longer term health effects as being entirely mediated by shorter-term effects involving insufficient recovery from excessive demands. For the purposes of this research, we accepted the operationalisation of work-related fatigue using the need for recovery at the end of a work day scale reported in Sluiter et al. (1999). In their study of 363 Dutch coach

drivers, Sluiter et al. (1999) found that need for recovery was a powerful predictor of psychosomatic complaints, sleep complaints, and emotional exhaustion. Sluiter, Frings-Dresen, van der Beek, and Meijman (2001) also found that neuroendocrine levels added to the prediction of perceived need for recovery and health complaints even after controlling for workload variables. Sluiter et al. (2001) found that cortisol reactivity during work, cortisol recovery immediately after work, and cortisol recovery during the day off-work, as well as adrenaline in baseline level and adrenaline recovery during the day off-work all predicted health complaints. They concluded that excessive work demands such as those experienced by many bus drivers may lead to insufficient recovery from work-related neuroendocrine reactivity and that this could contribute to greater fatigue, leading to poorer coping at work and even poorer health. Therefore, we expect that need for recovery will explain a significant amount of the variance in the three outcomes variables, even after controlling for workload.

This study also sought to measure affective well-being and physical symptoms as important indicators of the health status of bus drivers. Tse, Flin, and Mearns (2006) recently reviewed 50 years of research into bus driver health and well-being. It is clear from their study that there are serious negative health outcomes experienced by bus drivers including physical illnesses such as increased risk of cardiovascular disease, gastrointestinal disorders, and musculoskeletal problems, reduced psychological well-being (in particular, greater depression, anxiety, and symptoms of PTSD), and behavioural problems such as substance abuse.

Matthews and his colleagues (e.g., Matthews, 1993; Matthews, Dorn, & Glendon, 1991) found links between drivers' emotional well-being and their ability to effectively appraise hazards in their environment. A recent meta-analysis by Thoresen, Kaplan, Barsky, de Chermont, and Warren (2003) has demonstrated that both positive and negative affect are linked to a range of job-related attitudes including job satisfaction, organisational commitment, turnover intentions, and components of burnout. These results support the inclusion of a measure of affective well-being that captures both the positive and negative affective dimensions. Therefore, a measure of positive and negative affect was included in order to examine the impact of workload, need for recovery, and coping strategies on positive and negative affect.

The presence of physical symptoms has been identified as an important precursor to physical illness (Sluiter et al., 2001). One approach has been to measure employee's self-reports of symptoms (Spector & Jex, 1998). In a meta-analytic study involving 19 samples from a wide range of occupations (a total of 3,868 participants), Spector and Jex found correlations among job stressors (workload, interpersonal conflict, and organisational constraints), psychological strains (e.g., anxiety and depression) and physical symptoms of ill health.

Hypotheses

Figure 1 provides a summary of the predictions made in this study. Specific predictions are also provided below.

H1. First of all, it was predicted that workload (number of hours of driving per week) would significantly predict need for recovery which itself would significantly predict positive affect, negative affect, and physical symptoms, even after controlling for workload.

H2. Second, it was predicted that adaptive coping styles (including reappraisal and task-focused coping) would significantly predict need for recovery as well as positive affect, even after controlling for need for recovery.

H3. Third, it was predicted that maladaptive coping styles (including confrontive coping and emotion-focused coping) would significantly predict need for recovery as well as both negative affect and physical symptoms, even after controlling for need for recovery.

H4. Finally, workload may also be a significant negative predictor of adaptive coping styles and a significant positive predictor of maladaptive coping styles. When considered with the other hypotheses, this would mean that workload could be both directly and indirectly influence need for recovery. However, workload is not expected to directly influence positive affect, negative affect, and physical symptoms.

METHOD

Participants

Over 500 survey packages were distributed to bus drivers throughout Australia as part of a number of studies focusing on bus drivers. Only 159 responses contained all of the measures that were the focus of this study. The largest group of the drivers were aged between 40 and 49 years (35%) while the second largest group were aged between 50 and 59 years (31%). One hundred and fifty-one drivers were male and two were female with six omitting to answer this question. Seventy-one percent of drivers had three or more years' bus driving experience. Most drivers (69%) reported that they worked an average of between 40 to 59 hours per week. The bus drivers participated voluntarily in the study and no incentives were offered. Feedback was provided by sending a summary of the results to an organisational representative for distribution.

Measures

A cross-sectional survey instrument was developed for the study. Approximate completion time for the survey was 45 to 60 minutes.

The *Driver Coping Questionnaire* (DCQ; Matthews, Desmond, Joyner, Carcary, & Gilliland, 1996) assesses cognitive reactions to driving and asks respondents how they try to deal with driving stress. It measures five dimensions of coping derived from the transactional model of stress, with items referring to both explicit behaviours and internal psychological coping strategies (Matthews et al., 1996). The DCQ was designed to identify the coping dimensions applicable to driving. The five coping dimensions include: Confrontive coping (e.g., relieving one's feelings through risk-taking), Task-focused (e.g., making an effort to drive safely), Emotion-focused (e.g., criticising oneself for making mistakes), Reappraisal (e.g., viewing the drive as a learning experience), and Avoidance (e.g., trying to suppress negative feelings). The 5 coping scales each have 7 items. Participants are instructed to think of occasions during the last year when driving was difficult, stressful, or upsetting, and to use their experiences to indicate how much they usually engage in each of the activities on a scale from 1 (not at all) to 5 (very often). Scale scores can potentially range from 0 to 100. The higher the score on each scale, the more the driver engages in that particular coping strategy.

The *Need for Recovery Scale* (NR; Van Veldhoven & Meijman, 1994) measures occupationally-induced fatigue. The NR scale was developed in The Netherlands and was translated from Dutch into English by Sluiter et al. (1999). It contains 11 items (e.g., I find it hard to relax at the end of a working day) with yes (= 0) or no (= 1) response options. Scores normally range from 0 to 11 with low scores representing a higher need for recovery. In this study the scores were reflected by subtracting them from 22 so that they now ranged from 11 to 22, with higher scores indicating a higher need for recovery.

The *Job-Related Affective Well-Being Scale* (JAWS; Van Katwyk, Fox, Spector, & Kelloway, 2000) was designed to assess individuals' emotional reactions to their job along the two dimensions of pleasurableness (i.e., pleasure-displeasure) and arousal (high and low). The JAWS consists of 30 items, each beginning with a sentence stem, "My job made me feel…", followed by an emotion (e.g., My job made me feel at ease; My job made me feel miserable). Participants are asked to indicate how often they have experienced each emotion at work over the past 30 days on a 5-point response scale ranging from 1 = Never to 5 = Extremely Often. A wide variety of emotional experiences, both negative and positive, are included in the JAWS. The emotions can be placed into one of four subscales: high pleasure-high arousal (HPHA; e.g., energetic, excited), high pleasure-low arousal (HPLA; e.g., calm, content), low pleasure-high arousal (LPHA; e.g., angry, anxious), and low pleasure-low arousal (LPLA; e.g., bored, depressed). The total JAWS score was found to be an excellent predictor of work-related stressors and strains, outperforming measures of positive and negative affect (PA and NA respectively), and job satisfaction (Van Katwyk, et al.). The scores for each of the four subscales as well as the total JAWS score were calculated in this study. Further analysis of the items was undertaken to determine the factor structure of the scale before the regression analyses were performed.

The *Physical Symptoms Inventory* (PSI; Spector & Jex, 1998) asks respondents whether they have experienced any of the 18 symptoms on the scale over the past 30 days and which of those symptoms were severe enough to warrant medical attention. The symptoms involve discomfort, such as headache, backache, and stomach complaints, rather than symptoms like blood pressure or cholesterol, which cannot be directly experienced. For each of the symptoms, there are three response options. Respondents can choose "No" if they have not had the symptom in the last 30 days. If they did have the symptom, they are asked to choose between "Yes, but I didn't see a doctor" ("Have" symptom) and "Yes, and I saw a doctor" ("Doctor" symptom). The total PSI score is the sum of both "Have" symptoms and "Doctor" symptoms and can potentially range from 0 to 18. Higher scores indicate a greater number of physical symptoms.

Demographic questions. Demographic questions sought information about: age, gender, marital status, number of dependent children, length of time in current position, the normal number of hours worked each week, the number of hours spent driving each week, type of employment (e.g., full-time, part-time, casual), bus driving experience, number of passengers and passenger complaints, number of collisions, main type of work (e.g., urban routes, tour/charter, long-distance), and job satisfaction. The number of hours spent driving each week was used as a measure of workload.

Procedure

Participants were recruited from a number of sources, including all of the drivers employed at McCafferty's Express Coaches. Several other bus companies were randomly selected and contacted via telephone. Those who were willing to participate in the survey were sent survey packages to be distributed among their bus drivers. Each survey packet contained a cover letter explaining the aims of the study, a consent form explaining about confidentiality and anonymity of responses, the survey, and a reply-paid envelope.

Approximately three weeks after the survey distribution, a follow-up phone call was made to each organisation in an attempt to increase the response rate. In order to recruit more participants, the Federal Industrial Officer for the Transport Workers' Union of Australia was

also contacted via E-mail and agreed to assist with the recruitment of participants. Survey packages were sent to the Queensland, New South Wales, South Australian, and Western Australian State branch representatives who distributed them to a random sample of their members. The final response rate was approximately 28%, which is a fairly typical response rate for mailed surveys (Shaughnessy, Zechmeister & Zechmeister, 2003).

RESULTS

Table 1 lists the means, standard deviations, and internal consistency reliability coefficients of the subscales of the DCQ, Need for Recovery, Job-Related Affective Well-Being (total score and four subscales), and Physical Symptoms. Satisfactory internal consistency estimates were obtained, with alpha coefficients ranging from .67 (for Avoidance) to .97 (for the total score for Job-Related Affective Well-Being). The mean score for Weekly Driving Hours represents the number of hours spent driving each week. The range of responses for this question was from one to six, with 1 = less than 30 hours, 2 = 30-39 hours, 3 = 40-49 hours, 4 = 50-59 hours, 5 = 60-69 hours, and 6 = more than 70 hours each week. Most respondents indicated that they normally spent 40-49 hours driving each week. Drivers reported using more Task-Focused Coping (M = 82.36) and Reappraisal Coping (M = 65.80), than the other three coping strategies as would be expected from professional drivers. The mean score for Need for Recovery needs to be transformed before comparison with benchmark levels. We subtracted 11 from the mean score and multiplied the result by 100/11 [(15.84 – 11)*100/11 = 44.00] giving a scale ranging from a minimum of 0 to a maximum of 100. This score exceeds the mean levels of Need for Recovery reported for the six occupational groups (including coach drivers) reported in Sluiter, de Croon, Meijman and Frings-Dresen (2003). Therefore, we were justified in further examining which coping strategies were predictors of Need for Recovery.

Insert Table 1 About Here

Table 2 lists the intercorrelations (calculated using Pearson's r) among Weekly Driving Hours, the subscales of the DCQ, Need for Recovery, Job-Related Affective Well-Being (total score and four subscales), and Physical Symptoms. Weekly Driving Hours was significantly correlated with Need for Recovery (r = .32, p < .01), Confrontive Coping (r = .18, p < .05), and Avoidant Coping (r = .26, p < .01). Therefore, we can conclude that the first part of H1 (which predicted a link between Weekly Driving Hours and Need for Recovery) was supported as well as the part of H4 which hypothesised a significant link between Weekly Driving Hours and maladaptive coping strategies. No link was evident between Weekly Driving Hours and adaptive coping strategies. The significant correlations between Weekly Driving Hours and two of the affective well-being subscales (r = .22, p < .01 with LPHA and r = .18, p < .05 with LPLA) are indicative of a link between Weekly Driving Hours and affective well-being. However, it is likely that these correlations are explained by the significant correlation between Need for Recovery and the affective well-being subscales. Further analysis will follow which will control for the influence of Need for Recovery.

Insert Table 2 About Here

The four subscales of the JAWS (HPHA, HPLA, LPHA, and LPLA) were highly intercorrelated (r's from .53 to .84 in magnitude). Therefore, it was important to determine whether the items in the four subscales were actually assessing distinct constructs. There are two main competing approaches to describing the latent structure of affect. One approach (Watson, Wiese, Vaidya & Tellegen, 1999) has emphasised that there are two unipolar dimensions, representing combinations of pleasurability (high vs low) and arousal (high vs low).

Combinations of high pleasure and high activation are called positive affect, while low pleasure and high activation are called negative affect. The other main approach (Carroll, Yik, Russell & Barrett, 1999) has emphasised a bipolar model with the endpoints representing positive and negative valence. We decided to conduct a factor analysis of the 20 items used to form the four subscales of the JAWS. We chose to follow Gorsuch's (2003) recommendation to seek to confirm the emergent structure with exploratory analysis rather than confirmatory analysis. The reasoning behind this approach is that a latent structure that emerges repeatedly without a priori specification is far more compelling confirmation of structure than can be afforded by a confirmatory procedure that only assesses fit with one predefined model. We also followed Fabrigar, Wegener, MacCallum and Strahan's (1999) recommendation and used Parallel Analysis to determine the number of factors to extract.

The results of the Parallel Analysis indicated that there were two components with eigenvalues above the mean eigenvalues of 100 random datasets of the same dimensions as the one presented here. Consequently two components were extracted collectively accounting for 54.6% of the total variance. To aid in the interpretation of these two components, oblique (Oblimin) rotation was performed. The pattern matrix (presented in Table 3) revealed the presence of simple structure, with both components showing a large number of strong loadings, and all variables (apart from one item) loading substantially (i.e., with a loading $\geq .4$) on only one component.

Insert Table 3 About Here

The first factor was defined by the 10 items representing emotions with a positive valence (Energetic, Excited, Ecstatic, Enthusiasm, Inspired, At-ease, Calm, Content, Satisfied, and Relaxed) and one item with a negative valence (Fatigued), while the second factor was defined by eight items representing emotions with a negative valence (Angry, Anxious, Disgusted, Frightened, Furious, Depressed, Discouraged, and Gloomy). Therefore, the factors were labelled Positive and Negative Affect respectively. The correlation between the two factors was -.57, indicating that there was substantial overlap (approx. 32%) between the factors. The regression approach was used to produce factor scores on each of the two factors as this approach is the simplest one for creating factor scores (Tabachnick & Fidell, 2001). These scores have a mean of zero and a standard deviation of 1. These factor scores were used as outcome measures in place of the total JAWS score.

Hierarchical Regression Analyses

A series of hierarchical regressions were conducted that tested the contribution that workload made to the prediction of drivers' health and well-being by entering Weekly Driving Hours (as well as Need for Recovery for the other three outcomes) in the first step of the regression analyses, whilst the contribution of the DCQ coping styles to the prediction of drivers' health and well-being was assessed at step 2. These analyses allowed hypotheses 1 to 3 to be tested, with affective well-being now being represented by two constructs (Positive and Negative Affect). Six (or for some analyses, seven) independent variables were used as predictors, representing a cases-to-IVs ratio of approximately 25:1, which exceeds the required proportion (Tabachnick & Fidell, 2001). The dependent variables were drivers' scores on the scales measuring Need for Recovery, Positive and Negative Affect, and Physical Symptoms. The results for Need for Recovery and Physical Symptoms are presented in Tables 4, while the results for Positive and Negative Affect are presented in Table 5.

Insert Tables 4 and 5 About Here

The results of the first hierarchical regression analysis showed that, after controlling for Weekly Driving Hours (which was a significant predictor), two of the DCQ scales were significant predictors of Need for Recovery. Confrontive Coping ($\beta = .24$, $p < .01$) and Emotion-Focused Coping ($\beta = .26$, $p < .01$) each uniquely accounted for five percent of the variance in Need for Recovery. The second hierarchical regression analysis showed that, at the first step Weekly Driving Hours was not a significant predictor of Physical Symptoms ($\beta = -.07$, *ns*) while Need for Recovery was ($\beta = .52$, $p < .01$), uniquely accounting for 24 percent of the variance. At step two, only Confrontive Coping ($\beta = .23$, $p < .01$) was a significant predictor, uniquely accounted for 4 percent of the variance in Physical Symptoms.

The third hierarchical regression analysis showed that, at the first step Weekly Driving Hours was not a significant predictor of Positive Affect ($\beta = .08$, *ns*) while Need for Recovery was ($\beta = -.60$, $p < .01$), uniquely accounting for 32 percent of the variance. At step two, both Emotion-Focused Coping ($\beta = -.18$, $p < .05$) and Reappraisal Coping ($\beta = .36$, $p < .01$) were significant predictors, uniquely accounted for 2 and 8 percent (respectively) of the variance in Positive Affect.

The fourth hierarchical regression analysis showed that, at the first step Weekly Driving Hours was not a significant predictor of Negative Affect ($\beta = .01$, *ns*) while Need for Recovery was ($\beta = .52$, $p < .01$), uniquely accounting for 24 percent of the variance. At step two, both Confrontive Coping ($\beta = .28$, $p < .01$) and Emotion-Focused Coping ($\beta = .33$, $p < .01$) were significant predictors, uniquely accounted for 6 and 8 percent (respectively) of the variance in Negative Affect.

DISCUSSION

The main focus of this study was to determine the degree to which workload, and both adaptive and maladaptive coping styles would predict indices of driver health and well-being. The results of the multiple regression analyses indicate that the first hypothesis is supported with Weekly Driving Hours significantly predicting Need for Recovery, uniquely accounting for 10 percent of the variance. Need for Recovery is a significant predictor of each of the other outcomes, even after controlling for Weekly Driving Hours showing that Need for Recovery plays a very important role in explaining drivers' affective reactions and physical symptoms. The unique variance accounted for ranged from 24 percent for both Physical Symptoms and Negative Affect to 32 percent for Positive Affect. These results are similar to those reported by Sluiter, et al. (2003) which were based on hierarchical multiple regressions with various work demands entered at the first step, age entered at the second step, and Need for Recovery entered at the third step. Need for Recovery uniquely accounted for an additional 43 percent of the variance in subjective health complaints reported by coach drivers, an additional 10 percent of the variance in subjective health complaints reported by public bus drivers, an additional 11 percent of the variance in subjective health complaints reported by construction workers, and an additional 28 percent of the variance in subjective health complaints reported by both ambulance workers and hospital nurses.

The second hypothesis is partially supported with one of the adaptive coping strategies (Reappraisal coping) predicting 8 percent of the variance in Positive Affect even after controlling for Need for Recovery. Neither of the adaptive coping strategies is a significant predictor of Need for Recovery, Physical Symptoms, or Negative Affect. Two of the measures of maladaptive coping (Confrontive and Emotion-Focused Coping) significantly predict unique variance in Need for Recovery (both 5 percent), and Negative Affect (6 and 8 percent respectively) while only Confrontive Coping significantly predicts unique variance in Physical

Symptoms (4 percent). The results for Negative Affect and Physical Symptoms are important as these contributions were made after controlling for Need for Recovery supporting the third hypothesis and confirming that maladaptive coping strategies are able to explain variance in measures of Negative Affect and Physical Symptoms that is not explained by Need for Recovery. One maladaptive coping strategies (Emotion-Focused Coping) even accounted for 2 percent of the unique variance in Positive Affect.

While maladaptive coping strategies are predictors of the Need for Recovery, Negative Affect, and Physical Symptoms, this is not to say that adaptive coping strategies are not important in the role of a bus driver. It is likely that task-focused coping plays an important role in explaining drivers' performance outcomes such as safety-related behaviour. For example, Neal and Griffin (2002) described a series of studies that examined the linkages between safety climate and safety behaviour, as well as the role of general organisational climate, leadership factors, and individual factors that contribute to safety outcomes. Safety knowledge and motivation were two of these individual variables which mediated the relationship between perceptions of safety climate and self-reported safety behaviours. Task-focused coping strategies may focus on the development of greater safety-relevant knowledge and a commitment to safe work behaviour and therefore be very relevant to the role of a bus driver.

Brown, Westbrook and Challagalla (2005) have examined the moderating effect of adaptive and maladaptive coping on performance following a negative event. They focused on the negative emotions generated by a specific event, and the direct and moderating effects of coping strategies on subsequent performance. The three coping strategies were: task-focused, self-control, and venting. Self-control was found to reduce the effects of negative emotion, while venting increased the effects of negative emotion on performance. Task-focused coping did not moderate the effect of negative emotion but was positively related to performance.

The final hypothesis (H4) suggested that workload may significantly predict adaptive and maladaptive coping strategies and thereby indirectly influence Positive Affect, Negative Affect, and Physical Symptoms. Modest correlations were found between Weekly Driving Hours and both Confrontive Coping and Avoidant Coping. Therefore, maladaptive coping strategies may explain some of the relationship between workload and both Negative Affect and Physical Symptoms. However, the more substantive relationships are between Weekly Driving Hours and drivers' Need for Recovery which in turn is strongly related to Positive Affect, Negative Affect, and Physical Symptoms. The transactional model of driver stress (Matthews, 2001) places a great deal of importance on cognitive processes of appraisal and coping as mediators of the effects of personality and environmental demands. These results provide some support for the importance of maladaptive coping strategies in explaining "negative" outcomes such as Need for Recovery, Negative Affect, and Physical Symptoms. However, one adaptive coping strategy played an important role in predicting the Positive Affect. Clearly, there is scope for the development of interventions that would focus on the identification and modification of both adaptive and maladaptive coping strategies.

Limitations and Future Research

One of the limitations of the current study was its cross sectional design, which meant that causality could not be implied. This is an inherent problem in social science research. However, regression analyses do provide a useful way of gaining knowledge about the relative strength of relationships between variables, and the combined ability of various factors to predict certain outcomes. As shown in the results section, the multiple regression analyses found that

the predictor variables were able to predict between 32 percent (for Need for Recovery) and 51 percent (for Positive Affect) of variance. However, this does not rule out the possibility that other important influences may have been omitted from the regression models.

This study relied on self-report measures for all of the data which introduces an unknown amount of common method variance. Podsakoff, MacKenzie, Lee and Podsakoff (2003) reported estimates of the degree to which method variance typically contributed to the measurement of a construct and the relationships between measures of constructs. Approximately one quarter of the variance in any measure may be a result of systematic measurement error, while approximately 35% of the variance shared by measures of different constructs may be common method variance. Given these estimates, any of the significant results from this study should be interpreted with a great deal of caution.

The sample who responded to the survey may also not be representative of all Australian bus drivers and thus caution is required when generalising the results to other bus drivers. A more stringent stratified random sampling technique could be applied in future research to obtain a better representation of bus drivers. The study may also have limited generalisability due to the low response rate. For example, it may be that bus drivers who were not experiencing very much strain or fatigue took the time to respond to the survey. There is also a concern that only healthy bus drivers are currently working in the industry. As Evans and Johansson (1998, p. 104) stated, "the well-known 'healthy-worker effect' is pervasive in research on urban bus driving given its exceedingly high attrition rates". Further, relations between the variables may be influenced by other factors, such as perceived control, support, and self-efficacy, which were not considered in the current research. Such unmeasured dispositional or situational variables may account for variance in the measures of coping styles and health outcomes.

Future research could employ longitudinal studies, the use of objective measures of strain and/or fatigue to supplement subjective data, and mechanisms to follow up drivers who leave their employment due to health problems (Evans & Johansson, 1998). One theoretical issues that needs to be addressed concerns the inclusion of personality variables measuring driver traits such as those described in Mathews (2001, 2002). The addition of these variables would allow for a better test of the transactional model that Matthews proposed.

There are a number of organisational variables that may also contribute to the prediction of drivers' health and well-being such as leadership variables and perceptions of safety climate (Zohar, 2002; Barling, Loughlin & Kelloway, 2002). Therefore, transactional models of driver stress need to incorporate these organisational factors in order to adequately specify their influence and acknowledge that bus and coach drivers are part of an organisational system that is itself influenced by government regulatory bodies and the community (Machin, 2005; Ragland, Krause, Greiner & Fisher, 1998).

Practical Applications

Results of this study provide support for the importance of drivers developing both adaptive and maladaptive coping strategies. While drivers may benefit from opportunities to influence their workload and schedules, individually-focused training programs should assist them to develop more effective coping strategies. Semmer (2003) suggests that "person-oriented" approaches should not be pitted against "work-oriented" approaches as changes in work practices can be wasted if individuals lack the personal resources to take advantage of them. Machin (2003) has described an example of a "person-oriented" approach that incorporated a strategy of presenting realistic, job-related situations and multiple responses to

drivers and asking them to indicate the effectiveness of each response in dealing with that situation. The advantage of using this methodology was that drivers were presented with stimulus material that was directly related to their work tasks, that is, had a high level of psychological fidelity. The evaluation of the training indicated that drivers who perceived the situational exercises as most realistic reported better training outcomes. Overall, the drivers reported positive reactions to the training, high levels of post-training self-efficacy, and strong level of transfer intentions. Thus, training programs to assist drivers to develop better strategies for coping with stress and fatigue may also help to improve safety, which is an equally important outcome for bus and coach drivers.

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Table 1

Descriptive Statistics for Driver Coping Scales, Need for Recovery, Job-Related Affective Well-Being (Total Score and Subscales), and Physical Symptoms (N = 143)

Scale	*M*	*SD*	α
Weekly Driving Hours	2.86	1.00	NA
Confrontive Coping	35.58	11.95	.78
Task-Focused Coping	82.36	13.04	.73
Emotion-Focused Coping	44.67	13.01	.70
Reappraisal Coping	65.80	15.72	.78
Avoidance Coping	57.78	14.01	.67
Need for Recovery	15.84	3.54	.87
Job-Related Affective Well-Being (total)	105.26	20.79	.97
HPHA subscale	13.61	4.25	.90
HPLA subscale	16.90	4.32	.89
LPHA subscale	10.22	3.50	.79
LPLA subscale	11.13	3.85	.81
Physical Symptoms	4.22	2.99	.71

Table 2

Correlations Between Weekly Driving Hours, Driver Coping Styles, Need for Recovery, Job-Related Affective Well-Being (Total Score and Subscales), and Physical Symptoms (N = 143)

	1	2	3	4	5	6	7	8	9	10	11	12
1. Weekly Driving Hours	1.00											
2. Confrontive Coping	.18*	1.00										
3. Task-Focused Coping	.13	-.11	1.00									
4. Emotion-Focused Coping	.12	.39**	.16	1.00								
5. Reappraisal Coping	.14	-.19*	.60**	.06	1.00							
6. Avoidance Coping	.26**	.18*	.45**	.29**	.36**	1.00						
7. Need for Recovery	.32**	.42**	-.10	.38**	-.15	.14	1.00					
8. Job-Related Affective Well-Being (total)	-.15	-.51**	.18*	-.46**	.36**	-.02	-.60**	1.00				
9. HPHA subscale	-.06	-.35**	.24**	-.27**	.45**	.13	-.49**	.85**	1.00			
10. HPLA subscale	-.13	-.36**	.24**	-.36**	.41**	.09	-.57**	.89**	.80**	1.00		
11. LPHA subscale	.22**	.52**	-.06	.53**	-.12	.15	.52**	-.82**	-.53**	-.58**	1.00	
12. LPLA subscale	.18*	.55**	-.09	.49**	-.24**	.12	.56**	-.90**	-.66**	-.71**	.84**	1.00
13. Physical Symptoms	.09	.43**	.02	.37**	-.17*	.13	.49**	-.55**	-.40**	-.46**	.52**	.58**

Note: * $p < .05$ (2-tailed); ** $p < .01$ (2-tailed)

Table 3
Pattern Matrix for the JAWS Items after Principal Axis FA and Oblique Rotation.

Items	Factor I	Factor II
1. At-ease	**.58**	-.18
2. Angry	-.22	**.64**
3. Anxious	.14	**.58**
4. Bored	-.34	.32
5. Calm	**.75**	.00
6. Content	**.65**	-.13
7. Depressed	-.04	**.76**
8. Disgusted	-.02	**.68**
9. Discouraged	-.02	**.78**
10. Energetic	**.91**	.10
11. Excited	**.92**	.11
12. Ecstatic	**.70**	.10
13. Enthusiasm	**.72**	-.09
14. Frightened	-.09	**.49**
15. Furious	-.05	**.75**
16. Gloomy	-.22	**.65**
17. Fatigued	**-.42**	.26
18. Inspired	**.78**	.00
19. Satisfied	**.78**	-.10
20. Relaxed	**.76**	-.07
Percentage of variance explained (approx.)	45.7%	8.9%
Correlation between the factors		-.57

Note: Factor loadings above 0.4 in magnitude were used in interpreting the meaning of the factors and are highlighted in bold face type.

Table 4

Summary of Hierarchical Regression Analyses for Variables Predicting Need for Recovery and Physical Symptoms in Bus Drivers

Predictors	Dependent Variables					
	Need for Recovery			Physical Symptoms		
	β	*t*	sr^2	β	*t*	sr^2
Weekly Driving Hours	.32**	3.99	.10	-.07	-.93	.00
Need for Recovery	-	-	-	.52**	6.77	.24
After Step 1:	R^2 = .10 (Adj.R^2 = .09)			R^2 = .25 (Adj.R^2 = .24)		
	F (1,143) = 15.88**			*F* (2,141) = 23.71**		
Confrontive Coping	.24**	2.92	.05	.23**	2.79	.04
Task-Focused Coping	-.11	-1.13	.01	.16	1.71	.01
Emotion-Focused Coping	.26**	3.28	.05	.12	1.52	.01
Reappraisal Coping	-.13	-1.37	.01	-.16	-1.83	.02
Avoidance Coping	.06	.73	.00	.02	.25	.00
After Step 2:	R^2 = .32 (Adj.R^2 = .29)			R^2 = .35 (Adj.R^2 = .32)		
	Δ*F* (5,138) = 8.82**			Δ*F* (5,136) = 4.17**		

Note. * $p < .05$. ** $p < .01$. sr^2 = squared semi-partial correlation.

Table 5
Summary of Hierarchical Regression Analyses for Variables Predicting Positive and Negative Affect in Bus Drivers

Predictors	Dependent Variables					
	Positive Affect			Negative Affect		
	β	*t*	sr^2	β	*t*	sr^2
Weekly Driving Hours	.08	1.09	.01	.01	.19	.00
Need for Recovery	-.60**	-8.16	.32	.52**	6.72	.24
After Step 1:	R^2 = .34 (Adj.R^2 = .33)			R^2 = .27 (Adj.R^2 = .26)		
	F (2,136) = 34.38**			F (2,136) = 25.38**		
Confrontive Coping	-.10	-1.40	.01	.28**	3.72	.06
Task-Focused Coping	-.07	-.79	.00	.00	.02	.00
Emotion-Focused Coping	-.18*	-2.56	.02	.33**	4.48	.08
Reappraisal Coping	.36**	4.52	.08	-.10	-1.27	.01
Avoidance Coping	.13	1.74	.01	-.00	-.11	.00
After Step 2:	R^2 = .51 (Adj.R^2 = .48)			R^2 = .48 (Adj.R^2 = .45)		
	ΔF (5,131) = 8.94**			ΔF (5,131) = 10.45**		

Note. * $p < .05$. ** $p < .01$. sr^2 = squared semi-partial correlation.

LIST OF FIGURES

Figure 1. Proposed model for predicting bus driver need for recovery, positive and negative affect and physical symptoms.