Effect of Burnout on Accident Involvement in Occupational Drivers

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Managing the health and wellness of occupational drivers requires the recognition of burnout as an occupational hazard. However, the literature is dominated by studies of stress rather than burnout. The manner in which burnout may affect accident involvement is investigated in occupational drivers. The proposed causal structure is based on the stressor–strain model, in which burnout mediates between occupational stress and accident involvement. The study recruited 915 public transport drivers. The Copenhagen Burnout Inventory and an effort–reward imbalance scale were adopted to measure burnout and occupational stress, respectively. Results of the analysis indicated that burnout exerted a direct effect on accident involvement beyond the effect of occupational stress. Enhancing the perception of a safety culture does not significantly reduce the effect of occupational stress on burnout; however, it does significantly reduce the effect of burnout on accident involvement and thus indirectly alleviates the effect of occupational stress on accident involvement. In summary, as a comprehensive measure of the adverse effect of various types of chronic stressors, burnout provides a strong indicator for the identification of drivers who pose a risk to the organization and to road safety. Burnout management should be incorporated into overall stress management. Occupational drivers normally experience a low level of empowerment and long work hours; thus, a safety culture is crucial to this occupational category to reduce burnout and ensure workplace safety.

Unlike stress, burnout has received insufficient attention in the study of how to manage the health and wellness of occupational drivers. Prior research has established substantial evidence that burnout significantly relates to undesired organizations, people, and events, including safety outcomes (*1*). Burnout can directly influence job safety because of a reduced capacity to accomplish job tasks (*2*). It also can be a crucial factor mediating the effect of stress on health issues or addictive behaviors (*3*). The effect of burnout on health problems (e.g., cardiovascular disease) has been demonstrated in the medical field (*4*). In certain European countries with comprehensive social security systems, such as Sweden and The Netherlands, burnout is an established medical diagnosis (*2*). The importance of burnout is increasingly recognized in occupational health management.

The job environment of occupational drivers consists of various stressors. Occupational drivers must cope with multiple demands that are strong and often conflicting: customers (i.e., passengers), time pressure, and safety. An unfriendly physical work environment and the ergonomic layout of the driver's cabin also can increase driver stress. Another primary source of stress levels in occupational drivers is work schedule, in terms of lengths of work week and workday, break period quality, shifts (continuous or split), and rotation design (*5*). In addition, the working conditions of occupational drivers are monotonous, with repetitive task elements (e.g., maneuvering the vehicle, loading and unloading cargo or passengers) and homogeneous incoming information (i.e., traffic environment) (*6*). Occupational drivers sometimes find it difficult to receive positive feedback. Long driving hours and weekend shifts reduce their social and family time, which also decreases their opportunities to receive social and family support (*7*). Occupational drivers who invest significant energy in their jobs and do not obtain enough positive reinforcement (i.e., positive feedback) may experience burnout and jeopardize the health of people and companies as a consequence.

No published reports or studies investigating a direct relationship between burnout and accident involvement among occupational drivers were found in the literature, despite the importance of burnout. Therefore, this study investigates the significance of burnout for occupational drivers. The remainder of this paper is organized as follows. First, burnout is introduced. Next, the research framework and hypotheses are discussed, and an overview of the analytic approach of the study is provided. Then, results are presented. Conclusions and limitations of this study are presented in the final section.

WHAT IS BURNOUT?

The concept of burnout or job burnout was first introduced in the 1970s, when the construct was formally identified (*2, 8, 9*). Job burnout refers to a prolonged response to chronic emotional and interpersonal work-related stressors and is considered to have three dimensions: exhaustion, cynicism, and inefficacy (*8, 9*). It is an affective response to work characteristics, events, or conditions that cause a person to appraise the situation as stressful. Exhaustion and the sense of being overextended and depleted of emotional and physical resources are normally the first symptoms or signs to be identified and constitute the most widely accepted dimension of burnout. Cynicism refers to a negative, callous, or excessively detached response to certain aspects of the job and is a typical reaction to exhaustion; people distance themselves emotionally and cognitively from work-related factors in the attempt to minimize the quantitative or qualitative demands of the job, and workload reduction may enable the person to cope in an exhausted capacity. Finally, inefficacy refers to feelings of incompetence and a lack of achievement and productivity at work, which can result from exhaustion, cynicism, or both.

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Burnout occurs under conditions characterized by typical situational and personal factors. Job characteristics such as excessive demands (e.g., workload or time pressure) or lack of resources (e.g., social support) have been shown to relate to job burnout, regardless of the type of profession studied (*1*). In contrast, certain factors occur only in specific fields; such factors account for some of the variance in burnout scores. One example is emotion–work variables such as the requirement to suppress one's emotions on the job (*9*). Organizational factors also are known to affect burnout significantly. Certain values implicit in organizational processes and structures may lower the risk of burnout, such as fairness and equity, which influence the emotional and cognitive relationships that people develop with the workplace. Finally, personal factors have shown significant associations with burnout, but the effect size is not as large as that of situational factors (*9*). Personal variables that influence burnout include demographic characteristics (e.g., age, sex, marital status, and education level), personality characteristics (e.g., neuroticism), and job attitudes (e.g., expectations).

At the core of burnout is the depletion of individual energetic resources. This depletion represents a combination of physical fatigue, emotional exhaustion, and cognitive weariness, which may significantly affect a driver's involvement in accidents (*4*). For example, physical fatigue diminishes drivers' ability to perform driving tasks because it alters their level of alertness and vigilance; fatigue is a known critical factor in accident involvement (*10*). Cognitive weariness refers to a state in which thinking is slowed and mental agility and concentration are reduced; weariness also is associated with forgetfulness and difficulty in solving complex tasks (*4, 11*). Thus, cognitive weariness may significantly affect accident involvement because the driver experiences a slower-than-normal reaction time.

METHOD

Research Framework and Hypotheses

Many stressors may cause burnout, which in turn may lead to undesirable consequences such as absenteeism, health problems, and safety issues. This study focuses on occupational stress as the precursor to burnout and accident involvement as the consequence of burnout among occupational drivers. Occupational stress was selected for the analysis over other types of stress for two reasons. First, for companies, the factors contributing to occupational stress are more manageable than those that contribute to other stress types (e.g., life stress), and the investigation of the effect of occupational stress can provide managers and companies with valuable information. Second, burnout is the result of chronic stress rather than sudden trauma (*4*).

Driver stress usually is measured with the Driver Stress Inventory and frequently is discussed in transportation studies (*12*). However, the stress level measured with the Driver Stress Inventory largely depends on the changing driving environment; as long as the stress-inducing condition described by the item (e.g., driving behind a slow-moving vehicle or trying to overtake another vehicle) disappears, the induced stress would be reduced or disappear. Therefore, occupational stress appears to be more appropriate than driver stress in the study of burnout.

This study investigates occupational stress with an effort–reward imbalance (ERI) model (*13*). This ERI model proposes two types of occupational stress: (*a*) an imbalance between effort and reward and (*b*) overcommitment. It assumes that a lack of reciprocity between costs and gains (i.e., high effort and low reward) results in job stress, which eventually may result in burnout. A high level of overcommitment reflects excessive striving combined with a strong desire for approval and esteem. People characterized by a high level of overcommitment tend to maximize their efforts (*3, 13*). In summary, ERI and overcommitment represent the situational and personal factors, respectively, that contribute to burnout.

A trivariate mediation structure is proposed that is based on the stressor–strain model, in which burnout mediates the effect of occupational stress on accident involvement (Figure 1). Burnout is assumed to be associated with accident involvement because its typical manifestations reduce a driver's physical and psychological capacity to drive safely (*4, 10, 11*). Many theories and empirical studies have confirmed the effect of occupational stress on burnout (*1, 2*). Several studies have confirmed the direct effect of occupational stress on accident involvement (*14, 15*).

This study incorporates safety culture as a crucial factor in the relationships between the variables of interest. Safety culture may affect burnout in two ways. First, safety culture can be treated as an independent variable influencing burnout (*16*) and accident involvement (Figure 1*a*). Second, safety culture can be treated as a moderator variable, meaning that the significance of causal effects in the trivariate structure was affected by the perceived levels of safety culture among occupational drivers (Figure 1*b*). These causal effects are expected to be nonsignificant when occupational drivers perceive an excellent safety culture.

The proposed structure consists of several hypotheses (*H*s):

*H*1. Burnout exerts a significant positive influence on accident involvement.

*H*2. Burnout is a crucial indicator measure of the process through which occupational stress significantly influences accident involvement. The two related subhypotheses are

- *H*2a. Occupational drivers who experience relatively high ERI are more likely to be burnt out and therefore are more likely to be involved in traffic accidents, and
- *H*2b. Occupational drivers who display a high level of overcommitment are more likely to experience burnout and therefore are more likely to be involved in traffic accidents.

*H*3. A safety culture exerts a significant negative influence on burnout and accident involvement.

*H*4. The level of safety culture that occupational drivers perceive influences the relationships among occupational stress, burnout, and accident involvement.

Analysis Procedures

Testing *H*1, *H*2 (*H*2a and *H*2b), and *H*3 implies testing the mediating effect of burnout on the relationship between occupational stress and accident involvement. In this scenario, safety culture is an exogenous variable. Testing *H*4 implies testing the moderating effect of the safety culture on the trivariate relationships among occupational stress, burnout, and accident involvement.

Even though a causal structure containing latent factors may provide the best fit with techniques such as structural equation modeling (SEM), regression analysis is used to examine the causal structure for two reasons. First, because the dependent variable (accident involvement) is a binary variable, SEM is inappropriate. SEM uses estimation techniques such as maximum likelihood, generalized

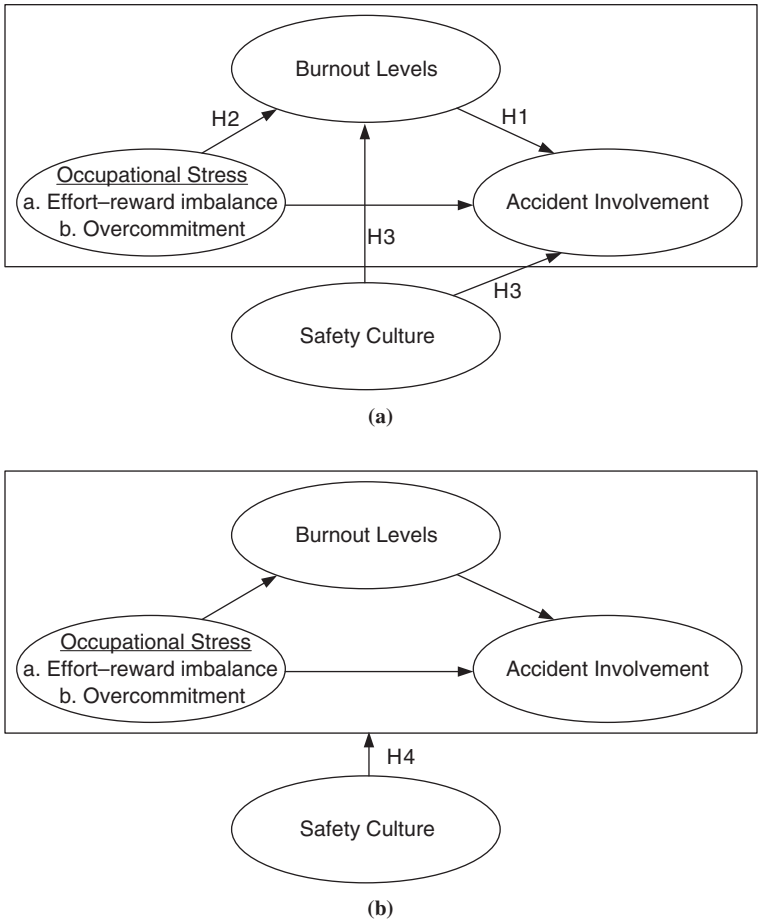

FIGURE 1 Trivariate mediation structure of occupational stress, burnout, and accident involvement: (*a*) safety culture as an exogenous variable and (*b*) safety culture as a moderator.

least squares, and weighted least squares, all of which require multivariate normal data to produce unbiased estimates (*17*). Second, even though SEM provides a more powerful test of causal effects (especially mediating effects) by simultaneously testing the path effects with *z*-tests, the regression approach can achieve a similar level of statistical power by increasing the sample size (*18*).

The use of regression to test the mediation effect of burnout required two models (*19, 20*). In the first, burnout was regressed against occupational stress; in the second, accident involvement was regressed against burnout. If the coefficients for the variables of occupational stress in the first model or burnout level in the second model were nonsignificant, then a mediating effect of burnout could be ruled out. If both coefficients were significant, then the mediating effect of burnout was tested with a modified Sobel test (*21–23*).

To test the moderating effect of safety culture, the median of the safety culture scores was used to split participants into two groups. The trivariate models were tested separately for the two groups, and results were compared. The median was chosen as the dividing point to keep the sample size of each group as large as possible and therefore maintain the statistical power of the tests for mediator effect.

Before conducting the regression analyses, the psychometric properties of the latent variables were examined. The internal consistency of each latent variable was assessed with Cronbach's α. The factorial structure for the occupational stress construct (i.e., ERI) was investigated with confirmatory factor analysis (CFA). This assessment was necessary to ensure that the ERI subscale scores (effort, reward, and overcommitment) could be used as independent variables in the regression analysis (*3*).

Measures

Burnout, occupational stress, and safety culture were measured with the following instruments: Copenhagen Burnout Inventory (CBI) (*24*), the 23-item ERI scale (*13*), and the generic safety culture index developed by the Global Aviation Safety Network (*25*).

- CBI. The CBI work-related subscale contains seven items, with the response to each item graded on a five-point scale from always (100) to never (0) or from very seriously (100) to very slightly (0). The average score for the seven items provided the participants' global score for work-related burnout. The Taiwanese version of the CBI scale developed by Yeh et al. (*26*) and Chang et al. (*27*) was used.
- ERI scale. This scale consists of 23 items. The first six items measure the participant's efforts at work, the next 11 items measure their rewards, and the final six items measure their possible overcommitment level. All items are rated on a five-point Likert scale. The global score for ERI was calculated as the sum of effort scores

divided by the sum of reward scores, with an adjustment for the number of items. The global score for overcommitment was computed as the sum of the corresponding six item scores, and a higher score indicated an increased likelihood that the participant was overcommitted at work. The Taiwanese version of the ERI scale developed by Tseng and Cheng was used (*28*).

- Safety culture index. This scale consists of 25 items covering various issues relevant to safety, including management's attitude to and focus on safety, employee's attitude to and focus on safety, culture of reporting, and reactions to reported errors and incidents. Responses to the items were scored on a five-point Likert scale ranging from 1 (disagree completely) to 5 (agree completely). The global score was computed as the sum of the 25 items, with possible scores ranging from 25 to 125. A global score of 92 or above indicates good safety culture.

Data

The data set was derived from a government project, which constituted an investigation of the practice of health examinations for the drivers of large passenger vehicles in Taiwan (*29*). The survey was conducted in April 2011 with self-administered anonymous questionnaires. Before the questionnaires were distributed, a meeting was held to explain the contents of the questionnaire to the representatives of each company. The respondents then sent the completed questionnaires directly to the survey team. A total of 1,079 questionnaires were distributed, and 915 valid questionnaires were received, yielding a response rate of 84.8%.

RESULTS

Participant Characteristics

Most participants were bus drivers whose primary task was carrying passengers between stations or stops with a large vehicle (e.g., 11.6 m long and 5.8-m axle distance) under a fixed timetable; driving distance per trip normally was between 10 and 40 kilometers. The average participant age was 43.29 years old, and each driver had approximately 9 years of driving experience. On average, drivers had been with their current company for 5.5 years. Standard deviations were relatively high, indicating a wide spread of characteristics (young and old, novice and experienced) among participants. Most public transport drivers in Taiwan are men, and 84.81% of the study participants were men. The average body mass index of participants was 25.46, which is slightly higher than the healthy normal threshold defined by the Department of Health in Taiwan. Drivers reported driving for an average of 9.47 h per day and spending an additional 1 h per day on work-related tasks such as cleaning the vehicle or stand-bys.

Psychometric Properties of Measures

Table 1 is a list of the 23 ERI items and mean scores and standard deviations obtained in this study. Table 2 is a summary of CFA modeling results for the three ERI components (effort, reward, and overcommitment). Each component was analyzed separately. Results indicate that the factorial structure of the effort component was congruent with the construct proposed by Siegrist et al. (*3*). However, two items of the reward component and one item of the overcommitment component were dropped to improve the goodness of fit. All the *p*-values for the chi-square (χ^2) test in the final models were significant; this finding may be attributed partly to the large sample size ($n = 915$). The relative chi-square value (χ^2/df) was between 4 and 5 for the effort component, which is satisfactory with a loose threshold of 5 (*30*). In contrast, the normed chi-square values for the reward and overcommitment components were both >5; the same findings have been reported in other ERI studies (*3*). The standardized root mean square residuals (SRMR) were all below the threshold of 0.05; the root mean square errors of approximation (RMSEA) for the effort and reward components were both below the threshold of 0.08; the nonnormed fit indices (NNFI) and comparative fit indices (CFI) were all above 0.9. Overall, these results indicate a good fit of the models.

Table 3 lists the Cronbach's α values, means, standard deviations, and correlations between the adopted measures. The Cronbach's α values for all measures are well above 0.7, indicating excellent reliability. The correlation matrix shows moderate positive correlations among burnout (BO), effort (ET), reward (RD), and overcommitment (OC) and weak to moderate negative correlations between safety culture (SC) and all other measures. These results meet the authors' expectations.

Effect of Burnout on Accident Involvement

Six regression models were investigated to assess the proposed hypotheses (Table 4). Models M1 and M2 examined the mediating effect of burnout on the relationship between occupational stress and accident involvement, and four models assessed the mediating effect of burnout when drivers perceived poor (Models M3 and M4) or good (Models M5 and M6) safety culture. Burnout level was measured as a continuous variable bounded by 0 and 100; thus, linear regression models were developed for building M1, M3, and M5. Robust regression was used because of the heteroscedastic errors. Accident involvement was measured as a binary variable and modeled with binary logit regression (M2, M4, and M6).

M1 shows that effort–reward ratio and overcommitment significantly influence burnout level. M2 exhibits a significant association between burnout and accident involvement. Sobel test results indicate that the mediating effect of burnout was significant between effort–reward ratio and accident involvement (Sobel statistic, 2.012; *p*-value, .044) and between overcommitment and accident involvement (Sobel statistic, 2.058; *p*-value, .040). Thus, the indirect or mediating effect of burnout on the relationship between occupational stress and accident involvement is significant. *H*1 and *H*2 (*H*2a and *H*2b) are supported by the evidence.

The safety culture variable consistently shows significant negative coefficients across regression models M1 and M2. This finding indicates that occupational drivers who perceived a relatively high level of organizational safety culture are less likely to be involved in traffic accidents or to display high burnout scores. This evidence supports *H*3.

For drivers who perceive a low level of safety culture, the mediating effect of burnout in the trivariate structure (i.e., effort–reward ratio or overcommitment leads to burnout, which leads to accident involvement) is significant, as shown by the significant coefficients for effort–reward ratio and overcommitment in M3 and of BO in M4 (Table 4). This result is confirmed by the Sobel test. For effort–reward ratio, the Sobel statistic was 2.479 with a *p*-value of .013; for overcommitment, the Sobel statistic was 3.088 with a *p*-value of .002.

TABLE 1 ERI Items, Means, and Standard Deviations

Item No.	Questionnaire Item	Mean	SD
Effort			
ERI 1	I have constant time pressure due to a heavy work load.	1.71	1.13
ERI 2	I have many interruptions and disturbances in my job.	1.29	0.76
ERI 3	I have a lot of responsibility in my job.	1.87	1.12
ERI 4	I am often pressured to work overtime.	1.59	1.04
ERI 5	Over the past few years, my job has become more and more demanding.	1.75	1.08
ERI 6	My job is physically demanding.	1.48	0.98
Reward			
ERI 7	I receive the respect I deserve from my superiors.	1.19	0.65
ERI 8	I receive the respect I deserve from my colleagues.	1.17	0.57
ERI 9	I experience adequate support in difficult situations.	1.20	0.66
ERI 10	I am treated unfairly at work.	1.24	0.77
ERI 11	My job promotion prospects are poor.	1.50	1.05
ERI 12	I have experienced or I expect to experience an undesirable change in my work situation.	1.45	0.96
ERI 13	My job security is poor.	1.49	1.07
ERI 14	My current occupational position adequately reflects my education and training.	1.22	0.67
ERI 15	Considering all my efforts and achievements, I receive the respect and prestige I deserve at work.	1.26	0.74
ERI 16	Considering all my efforts and achievements, my work prospects are adequate.	1.38	0.87
ERI 17	Considering all my efforts and achievements, my salary/income is adequate.	1.44	0.99
Overcommitment			
OC 1	I get easily overwhelmed by time pressures at work.	2.36	1.10
OC 2	As soon as I get up in the morning I start thinking about work problems.	2.88	1.16
OC 3[a]	When I get home, I can easily relax and "switch off" work.	2.60	1.12
OC 4	People close to me say I sacrifice too much for my job.	2.87	1.15
OC 5	Work rarely lets me go. It is still on my mind when I go to bed.	2.48	1.09
OC 6	If I postpone something that I was supposed to do today I'll have trouble sleeping at night.	2.83	1.20

NOTE: No. = number; SD = standard deviation.
[a]OC 3 is a reverse question. The score has been transformed; a higher score indicates a higher level of overcommitment.

TABLE 2 Validity of Empirical Factorial Structure of ERI

Goodness-of-Fit Index	Effort	Reward		Overcommitment	
		Initial	Final[a]	Initial	Final[b]
$\chi^2(p)$	39.007 (.000)	367.577 (.000)	146.654 (.000)	110.295 (.000)	42.668 (.000)
χ^2/df	4.334	8.965	6.111	12.255	8.534
SRMR	0.022	0.050	0.040	0.042	0.024
RMSEA	0.060	0.093	0.075	0.111	0.091
NNFI	0.978	0.881	0.931	0.921	0.963
CFI	0.987	0.912	0.954	0.953	0.982
AIC	63.007	417.577	188.654	134.295	62.668
BIC	120.834	538.050	289.852	192.122	110.857

NOTE: df = degrees of freedom; AIC = Akaike information criterion; BIC = Bayesian information criterion.
[a]ERI 10 and ERI 15 were dropped.
[b]OC 3 was dropped.

TABLE 3 Summary Statistics and Correlations Between Driver Burnout, Occupational Stress, and Perceived Safety Culture

Measurement	Cronbach's α	Mean (SD)	Correlation				
			BO	ET	RD	OC	SC
BO	.921	24.37 (21.14)	1				
Occupational stress							
ET	.866	9.67 (4.75)	0.66***	1			
RD[a]	.847	12.06 (5.14)	0.53***	0.68***	1		
OC[b]	.867	13.43 (4.61)	0.51***	0.48***	0.36***	1	
SC	.982	103.43 (17.61)	–0.47***	–0.36***	–0.44***	–0.29***	1

NOTE: Blank cells = not applicable.
[a]ERI 10 and ERI 15 were dropped.
[b]OC 3 was dropped.
***Significant at the .01 level.

TABLE 4 Six Regression Models for Testing the Proposed Hypotheses

Independent Variable	Whole Data		Low SC		High SC	
	BO Levels (M1)	Accident Involvement (M2)	BO Levels (M3)	Accident Involvement (M4)	BO Levels (M5)	Accident Involvement (M6)
Effort–reward ratio	10.253*** (7.36)	–0.014 (–0.06)	6.825*** (3.78)	0.052 (0.20)	13.459*** (5.98)	–0.364 (–0.74)
OC	1.637*** (11.68)	0.005 (0.17)	2.287*** (9.12)	–0.039 (–1.14)	1.427*** (8.07)	0.062 (1.57)
BO	na	0.012** (2.09)	na	0.022*** (3.28)	na	0.002 (0.21)
SC	–0.419*** (–10.17)	–0.018*** (–3.05)	na	na	na	na
Traffic violation	na	0.949*** (5.33)	na	0.716*** (3.52)	na	1.440*** (4.59)
Age	–0.345*** (–5.44)	–0.023** (–1.98)	–0.416*** (–4.47)	–0.025* (–1.75)	–0.229** (–2.37)	–0.025 (–1.17)
Gender (male = 1)	–1.786 (–1.21)	0.454 (1.58)	–7.059*** (–3.36)	0.385 (1.20)	1.661 (0.71)	1.019 (1.41)
Body mass index	–0.137 (–0.91)	na	–0.078 (–0.31)	na	–0.231 (–1.17)	na
Avg. daily working hours	0.381** (2.20)	0.084*** (2.66)	0.843*** (3.48)	0.056 (1.48)	0.131 (0.50)	0.148*** (2.60)
Constant	42.138*** (7.57)	–2.699*** (–3.25)	52.939*** (6.30)	–1.890* (–1.95)	29.708*** (3.78)	–4.844*** (–2.66)
Statistics						
AIC	7,663.659	731.434	4,023.019	457.145	3,689.527	280.550
BIC	7,702.210	774.805	4,052.044	490.316	3,718.261	313.388
Log likelihood	–3,823.829	–356.717	–2,004.510	–220.573	–1,837.764	–132.275

NOTE: Numbers in parentheses are *t*-values. Shading denotes parameters required to calculate mediating effects at burnout. na = not applicable; avg. = average.
*$p < .1$; **$p < .05$; ***$p < .01$.

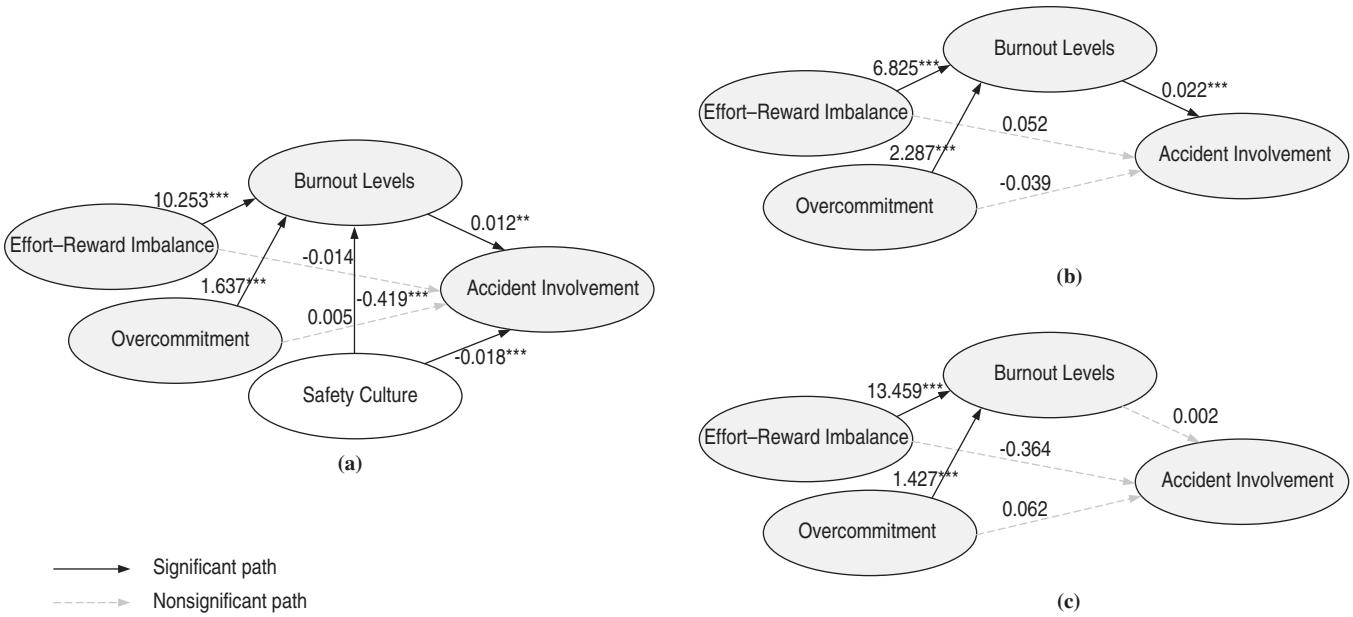

FIGURE 2 Estimated structures and path coefficients: (*a*) whole data, (*b*) low safety culture, and (*c*) high safety culture (**$p < .05$; ***$p < .01$).

In contrast, for drivers who perceive a high level of safety culture, no similar mediating effect was evident; the coefficient for BO was nonsignificant in M6, but the coefficients for effort–reward ratio and overcommitment were significant in M5. Therefore, *H*4 is supported.

For the remaining variables, the self-reported traffic violations are positively related to accident involvement. This finding indicates that occupational drivers who incur a high number of traffic violations are more likely to be involved in traffic accidents. The age variable showed a significant negative correlation with burnout levels and accident involvement across all regression models. This result indicates that older occupational drivers are less likely than younger drivers to be affected by high levels of burnout or to be involved in traffic accidents. Finally, average daily working hours are significantly and positively correlated with burnout levels and accident involvement. This finding indicates that occupational drivers who work longer hours are more likely to experience high levels of burnout and to be involved in traffic accidents than drivers who work fewer hours.

The estimated structures and path coefficients derived from the regression models are summarized in Figure 2.

DISCUSSION OF RESULTS

A trivariate mediation structure was proposed to explain the relationship between occupational stress, burnout, and accident involvement, and the proposed structure was tested statistically. In addition, safety culture was examined for its effect as an exogenous factor or as a moderator on the structure. Data from 915 Taiwanese public transport drivers were analyzed.

Results indicate that burnout exerts a direct effect on accident involvement, beyond the direct effect of occupational stress on accident involvement. Enhancement of the perceived safety culture does not significantly suppress the effect of occupational stress on burnout but significantly reduces the effect of burnout on accident involvement. Thus, the effect of occupational stress on accident involvement is indirectly lessened when safety culture is enhanced.

Burnout and the Management of Health and Wellness

Study results indicate that, compared with the association between burnout and accident involvement, the effect of occupational stress on accident involvement is relatively small. Previous studies have reported similar results, showing the relatively weak effect of occupational stress. Strahan et al. show that the variable of safety climate provides a stronger predictor than occupational stress for both fatigue-related behavior and near misses (*15*). This result may be explained at least partly by the existence of confounding factors between stress and traffic accidents. Coping strategies, for example, have emerged as a significant mediator between stress and driving safety (*31, 32*). Drivers who adopt task-focused strategies enhance their driving safety; those who use confrontational strategies exhibit riskier driving behavior.

In contrast, the representations of burnout and safety culture (e.g., physical fatigue in burnout; documented safety policies) are directly linked to driving safety. These variables have been shown to be relatively strong predictors of accident involvement in both this study and prior research. This result implies that burnout would provide a more reliable indicator than occupational stress to identify occupational drivers who may pose a safety risk.

Reducing burnout among occupational drivers would decrease the risk of accident involvement; stress management programs are critical to reduce burnout levels. Study results indicate that the association between each of the occupational stress variables (ERI and overcommitment) and burnout level was significant, irrespective of the causal structure. This finding confirms the authors' fundamental assumption that burnout is a consequence of chronic stress. Therefore,

effective stress management programs can be expected to reduce accident involvement indirectly by minimizing the occurrence of burnout among drivers.

The effects of ERI and overcommitment on burnout are both significant. This finding suggests that stressors that arise in the work environment or in the occupational driver may raise the driver's burnout level significantly. The effort and reward components of the adopted 23-item ERI scale provide information about work–environment stressors critical to occupational drivers. According to factor loadings in the CFA, the component demanding the most effort from Taiwanese public transport drivers is time pressure, followed by physical demand. Because occupational driving requires adherence to strict timetables, the driver's empowerment is reduced (*33*). Driving time is heavily affected by elements beyond the driver's control, such as traffic congestion, which is especially problematic in urban areas. As a result, time pressure becomes a major source of distress among Taiwanese public transport drivers. Strategies such as a flexible timetables or specialized training to effectively cope with driver stress can reduce the adverse effect of time pressure on occupational drivers (*32*).

Occupational drivers recognized the physical demand component as the second main source of distress. Even though the requirements for controlling a vehicle are physically light, occupational driving is characterized by continuous whole-body vibration and long hours of sitting and concentrating (*7, 33*). Such factors contribute considerably to the physical demands of occupational drivers. Continuous whole-body vibration can be reduced by good cabin design, a strategy used by many companies in the United States (*33*). Study data indicate that Taiwanese occupational drivers work for 10.4 h per day, on average, which far exceeds the normal 8-h Taiwanese workday. Countermeasures to reduce hours of service are highly recommended.

For stressors that arise from personal factors, study results indicate that overcommitment is strongly related to burnout symptoms. According to the factor loadings in CFA, the item "Work rarely lets me go. It is still on my mind when I go to bed" contributed the most variance in overcommitment scores. This result suggests that overcommitted occupational drivers may overinvest and be obsessed with their jobs, which favors and fuels the imbalance and core of the burnout process.

In addition to the ERI associated with occupational stress, safety culture is another factor that shapes the work environment of occupational drivers and influences their burnout levels. Study results indicate a significant association between safety culture and burnout; similar findings have been reported in prior studies on other professions, such as nursing (*34*). Safety culture reflects the perceived working conditions and the influence of this environmental consideration on the person's affective perception. Among occupational drivers, these factors are especially relevant if various job demands are in conflict (e.g., adherence to timetable versus maintaining safety). An enhanced safety culture helps occupational drivers reduce psychological conflicts when faced with opposing demands on the job, which in turn alleviates stress levels. Study results confirm that safety culture directly influences accident involvement and indirectly influences accident involvement through burnout.

Long working hours are associated with high burnout levels. This result meets the authors' expectations because burnout is a consequence of chronic stress, which is strongly related to working hours. Study results also show that the correlation between working hours and burnout level is significantly reduced, but still positive, for drivers who perceive an excellent level of safety culture. This finding suggests that a positive organizational culture may partially reduce the adverse effect of increased work demands on employee health outcomes (i.e., burnout) (*35*).

In summary, workplace safety can be promoted by providing various resources to working individuals such as job empowerment, a positive workplace climate, and co-worker support. Unfortunately, the tasks of occupational driving make it a low-autonomy job, and long hours spent on the road mean that drivers spend little time with co-workers and families. Therefore, a culture of safety is crucial to enhance the workplace safety of occupational drivers.

Limitations and Future Research

The analysis results indicate that older drivers exhibit lower levels of burnout than younger drivers. Because age is associated with driving experience, burnout appears to be more of a risk earlier in one's career (*9*). However, this study design was cross-sectional; thus, findings may suffer from survival bias in that occupational drivers who burn out early in their careers are likely to quit their jobs, leaving those who consequently exhibit lower levels of burnout. It also is possible that young drivers are more overcommitted than older professionals. They expend tremendous energy in their tasks, which exacerbates the imbalance between what is invested and what is obtained. However, the manner in which age affects burnout merits further investigation.

The 23-item ERI scale used in this study is a generic occupational stress scale that can be applied in various professions. Scales that identify the specific stressors of a certain job (such as occupational driving) also can be developed. For example, Tse et al. developed effort items of the ERI scale specific to bus drivers (*36*). Occupation-specific scales should provide a clearer account of the source of variance in stress scores compared with generic scales, which would assist in designing countermeasures. However, occupation-specific scales may suffer from relatively weak connections to stress consequences such as burnout (*37*).

The results of this study demonstrate that burnout exerts a significant direct effect on accident involvement. However, the experience of being involved in traffic accidents also may exacerbate driver stress and burnout (*38*). According to the loss cycle principle, burnout increases the risk of accident involvement; involvement in traffic accidents leads to fear of driving, which in turn increases stress and burnout (*39*). Longitudinal studies may help clarify these directional effects.

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