VALIDATION OF THE COPSOQ AND BDJD-24 AS A JOB DEMAND SCALE FOR ASSESSING TAXI DRIVERS' SAFETY PERFORMANCE: SPECIFIC VS. GENERAL JOB DEMANDS

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Abstract

Background: The Job Demand – Resource Model (JD-R) is a job-stress model that focuses on assessing the effect of the employees' health-related outcomes, and their performances due to stress induced by their job demands, and job resources. Different occupations possess different combinations of specific job-related demands, and job resources. The Copenhagen Psychosocial Questionnaire (COPSOQ) is an established self-reported tool that has been widely used to measure general job demands through the JD-R model. In contrast, the BDJD-24 is a model that was developed to assess the specific job demands of the bus drivers' job demands.

Objective: This study aims to measure the validity and reliability of the job demand questionnaire by applying it on the taxi drivers of Malaysia so as to assess their safety performance (safety motivation and safety compliance).

Method: A sample of 33 (N = 333) taxi drivers from the Klang Valley, Malaysia was recruited. Participants completed the questionnaire in the native language (Malay). To examine the psychometric properties of the COPSOQ and BDJD-24, we used the Exploratory Factor Analysis (EFA) derived from SPSS, and then confirmed it with the Confirmatory Factor Analysis (CFA) derived from AMOS.

Results: The internal consistency was found to be acceptable, between 0.71 to 0.84. The CFA revealed that the taxi drivers' job demands, as proposed, had a 5-dimensional influence. The five demands (i.e. emotional, hiding emotion, sensory, time, and safety) were clearly distinguished in the factor analysis. The KMO was adequate, at 0.78, and the variance for the 5-factor structure was 51.97%. The CFA also confirmed the correlation among these demands.

Discussion: It is found that the COPSOQ and the BDJD-24 measurement were both reliable and valid for measuring the taxi drivers' job demands. However, the general vs. specific job demands hypothesis, as proposed by the JD-R model, was not supported. The general job demands (emotional demands) were found to be more strongly associated with safety motivation, and safety compliance. The practical implications and limitations of the present study are further discussed in the paper.

Introduction

Taxi driving is a highly demanding job (1,2), and it can potentially affect the driver's performance (i.e. safety). In general, job demands refer to the physical, psychological, social and organisational aspects of the job that requires sustained physical, and/or mental efforts which may be associated with physiological, and/or psychological costs (3). Numerous studies have provided solid evidence to show the influence of job demands on drivers' safety performance at work. These studies have also proposed major actions which can be applied to mitigate accidents caused by poor safety performance. Nonetheless, accidents continue to occur. In recent years, Europe has reported that 34,000 transport workers have sustained injuries during work (4). The report also mentioned that in 2013, a total of 495 cases out of 14398 road accidents that occurred in a span of 30 days, had involved commercial drivers (i.e. lorry drivers, taxi drivers, and bus drivers). In 2014, around 16% of the fatalities at work involved employees who worked in the transportation sector (5). Meanwhile, in the United States (US), about 82.7% of accidents among truck drivers were caused by poor safety performance caused by the drivers (6). Safety performance can be conceptualised through safety compliance, and safety motivation (7) In this paper, safety compliance is when the drivers' core activities that need to be carried out by the driver has to be maintained as safe whereas safety motivation is the driver's attitude towards safety which, in turn, determines safety compliance (8)

Specific Measurement on Job Demands for Taxi Drivers

Although studies have been examining job demands, and their high influence on drivers' performance and well-being, it is rare to come across those specific measurements that cater to specific occupations (i.e. taxi drivers). Although taxi drivers belonged to the category of professional drivers (9), or commercial drivers (10), together with other types of drivers (i.e. bus drivers, coach drivers, truck drivers, taxi drivers), the work descriptions of the taxi driving occupation are unique from other drivers. This implies that taxi driving needs to have its own assessment scales for measuring job demands. It was observed that previous studies on job demands of professional drivers had mainly focused on bus drivers (11-13) and truck drivers (14), predominantly.

There are no clear reasons as to why certain job demands are more prevalent in certain occupations. As an example, psychological demands (11,12), have been commonly noted to be associated with drivers' well-being and health. Another is the general quantitative demands (14,15) followed by physical demands. These have been highlighted in a study of Taiwan bus drivers (16). In another study, Bakker and Demerouti (3) highlighted the inadequate focus given to job demands for certain occupations such as emotional demands which are linked to professional drivers. One study, however was performed in Malaysia by Husain, Mohamad and Idris (17) who studied the taxi drivers.

Based on the studies mentioned above, it was proposed that specific job demand scales ought to be developed to suit certain types of occupations because using the general Job Demand – Resource model (3) may be in adequate. This call was responded by Meijman and Kompier (18) in 2013; they developed a Job Demand scale for specifically, the bus drivers in Spain (19). They formulated the specific measurements of job demands so as to assess the taxi drivers by following one study (14,15) conducted in Taiwan. It appears that there were several specific job demands that were significant in influencing the unsafe behaviour of the bus drivers. These job demands encompassed traffic, passengers, vehicles, colleagues, hours and schedules of work (20). Looking at the taxi drivers' safety

behaviour, the meta-analysis indicated that only a few types of job demands were significant, such as risks and hazard, physical, and complexity demands (21).

Taxi Drivers' Job Demands
Previous studies supported the argument that taxi drivers' job demands are distinct from other professional drivers; it was also noted that taxi drivers had to cope with time demands (i.e. the need to drive for a longer duration; 10 hours/day in Taipei, 15-17 hours/day in South Africa, and 18-20 hours/day in the United States, as compared to other professional drivers who drive 8-8.5 hours/day) (22,23). It was further observed that taxi drivers were responsible for the lives of other people (i.e. passenger) (24) since their job entails having direct interactions with passengers. Thus, they had more likelihood of having conflicts with passengers, thereby reducing their safety performance (i.e. risky driving).

Another job demand of the taxi drivers is safe driving (25), and safety precautions from assaults (26). Cases of such had been highlighted in Iran where it was detected that taxi drivers were more inclined towards suffering from cognitive failures during driving, thereby affecting their safe driving (27). These taxi drivers were also exposed to physical strains when driving within confined spaces (25).

Using a combination of scales adapted from the COPSOQ (28) which encompassed the demands at work scale (emotional demands and hidden emotional demands), and the specific bus drivers' job demands scale, the BDJD-24 (19), this study aims to develop and propose a specific job demand scale for taxi drivers in Malaysia.

Methods
Samples and Procedure
Based on the local data resources, the sampling frame obtained for this study encompassed taxi drivers who were operating in several transport stations and taxi stations within the Klang Valley. Since the taxi paths

and destinations were not consistent, we conducted the survey based on a paper-pencil questionnaire at 22 main taxi stations/stands with majority of the responses generated from the following terminals: Integrated South Terminal (TBS), Bandar Tun Razak Taxi Stand (near Light Rail Transit (LRT) stations), Shah Alam Taxi Stand, KLCC Jalan Ampang Taxi Stand, Subang Airport Taxi Station, KL Sentral Terminal, and USJ Subang Jaya Taxi Stand. The respondents who comprised taxi drivers were asked to complete the questionnaire. Their contact numbers were recorded as a means to ease the questionnaire retrieval. The survey was done during their operation hours. The respondents were given the flexibility to complete the questionnaire at any time to their convenience. Upon completion, each participant was rewarded with a gift of participation. The inclusion and exclusion criteria are that participants must be able to read and understand either Malay or English, since the questionnaire was prepared in both languages. At the time of this study, the total number of taxi drivers within the Klang Valley amounted to 40,916 (29). Considering the study objectives and limitations in getting the taxi drivers' responses (30), this study utilised convenience sampling as an approach to gather respondents. According to Krejcie and Morgan (31), the sample size should be 380, hence a total of 600 questionnaires were distributed to the taxi drivers but the response rate was only 56% (333 out of 600).

Instrument
The job demands instrument was assessed using the Malay-English version of the questionnaire which had been translated by a professional interpreter.

In this study, the general job demands of emotional demands were measured using a three-item scale adapted from the Copenhagen Psychosocial Questionnaire (COPSOQ) which was developed by Kristensen, Hannerz, Hogh and Borg (28). The scale ranged from (1) Never, to (5) Always. The reliability of the scale is acceptable (α=0.80). The general job demand of hidden emotional demands was measured using a 4-item scale which was

adapted from the COPSOQ. The scale ranged from (1) Never, to (5) Always. The internal consistency (Cronbach α) for the hidden emotional demands was (α=.71). The third job demands of sensorial demands, were assessed using a 4-item scale from the COPSOQ which were revised to suit the current setting. The reliability for the sensorial demands was acceptable (α=.79).

The specific job demands encompassing safety demands, and time demands were assessed with the Bus Drivers' Job Demands Scale (BDJD-24), which was developed by Boada-Grau, Prizmic-Kuzmica, González-Fernández and Vigil-Colet (19). The scale ranged from (1) Strongly disagree to (5) Strongly agree. Safety demands were measured using a 4-item scale while time demands were measured using a 4-item scale. The reliability for the safety demands (α=.76) and time demands (α=.72) was acceptable.

The safety performance measures were adopted from Neal and Griffin (32) and safety motivation was assessed with a 3-item scale which ranged from (1) Strongly disagree to (5) Strongly agree. The reliability of this scale was acceptable (α=.84). Meanwhile, safety compliance (ɤ =0.83) was measured with a 2-item scale which ranged from (1) Strongly disagree to (5) Strongly agree.

Analysis
Exploratory factor analysis was conducted by using the factoring analysis. The extraction method of maximum likelihood was used by applying the Promax Rotation Method. The aim of using this method was to clarify the structure of the factors which were extracted from the scale, as shown in Table 1. In this study, the test of sphericity was significant (0.001), and suitable for the factoring analysis. The initial KMO index (0.78) also showed that the data were appropriate. In this study, we considered the factor loading value that was greater than 0.40. We then calculated the reliability of the five types of job demands, and two safety performance scales. The SPSS (Statistical Package for the Social Sciences)

version 21.0 was used to conduct the above analysis.

Table 1 shows the mean, standard deviation, and inter–item correlation between the studied variables. All items that were inter-correlated were statistically significant, except for hidden emotional demands.

Table 1: Means, standard deviation and correlations for studied variables (N=33)

Model variables	M	SD	1	2	3	4	5	6	7
1. Safety motivation (safemot)	4.47	.61	-						
2. Safety compliance (safecom)	4.53	.68	.74***						
3. Emotional demands (emotion)	2.70	.92	-.19***	-.20***					
4. Hiding emotion demands (hide)	2.94	.90	.03	.05	.50***				
5. Sensorial demands (sensor)	4.28	.74	.27***	.26***	.14*	.24***			
6. Safety demands (safety)	2.09	.82	-.23***	-.24***	.29***	.18***	-.25***		
7. Time demands (time)	3.18	.95	.12*	.11*	.10	.09	-.14*	.20***	-

*p < .05, **p < .01 and ***p < .001

The validity matrices were then transformed into a model, and the model was analysed using the AMOS statistical software (33). Through the confirmatory factor analysis, we tested the invariance of our hypotheses, between 1-factor structure and 5-factor structure. The analysis was assessed by using several fit indices, such as the goodness-of-fit index (GFI), Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis-Fit Index TLI, and the comparative-fit-index (CFI).

The goodness-of-fit statistics $\chi 2$ value was reported. The acceptable values for GFI, TLI, and CFI were above the value of 0.90. An acceptable value for the RMSEA should be one that was smaller than 0.08 (34). For the estimated competing model, we conducted several assessments to measure the significant differences for each model, from the 1-factorial structure to the 5-factorial structure, as stated in Table 2. Lastly, we conducted a path analysis using AMOS 20 to test the hypothesis on the association of each job demand to the safety performance scales (safety motivation, and safety compliance).

Table 2: Exploratory factor analysis

| Dimension and items	I	II	III	IV	V	Communalities
Safety demands						
In the suburbs, I regularly exceed the speed limits.	0.86					.71
I often speed up to go through the yellow light.	0.74					.51
I sometimes takes the right of ways, otherwise it take too long.	0.52					.28
I regularly approach a crossing at high speed, because then, I'm easier given the right of way.	0.50					.38
Sensory demands						
Does your work demand a great deal of concentration?		0.88				.73
Does your work demand your constant attention?		0.84				.75
Does your work require you to be alert to other road users actions		0.53				.34
Emotional demands						
Does your work put you in emotionally disturbing situations?			0.78			.61
Is your work is emotionally demanding?			0.74			.56
Do you get emotionally involved in your work?			0.69			.61
Time demands						
As a driver, I do anything to depart and to arrive on time				0.74		.52
As a driver, I feel that I have to run on time at all expense.				0.68		.45
If I am few minutes late, I want to catch up one way or another				0.60		.52
In order to drive on time, I sometime force myself				0.5		.42
Hiding emotion demands						
Does your work require that you act differently from what you feel?					0.74	.59
Does your work require that you hide your feelings?					0.65	.50
Does your work require that you do not state your opinion?					0.50	.36
% variance explained (after rotation)/factor	16.84	17.84	8.52	5.49	3.28	
% Total variance explained (%)	51.97					
KMO measure of sampling adequacy	0.754					

Results
Socio-Demographics Distribution
The samples consisted of 333 taxi drivers (3.6% female and 96.4% male). Their mean age was 38.96 years ($SD = 1.87$) and the mean years of working experience as taxi drivers was 4.89 years ($SD = .96$). Majority were Malays (89.1%), followed by Chinese (4.2%), Indians (5.7%), and other races (.9%). Fifty percent (51.1%) of the taxi drivers were owners of their own taxi

vehicles, through the hire purchase agreement with a taxi company while 30.6% held individual ownership, and 17.6% were leasing the taxis from companies or other individuals. Figure 1 illustrates.

Figure 1: Proposed model
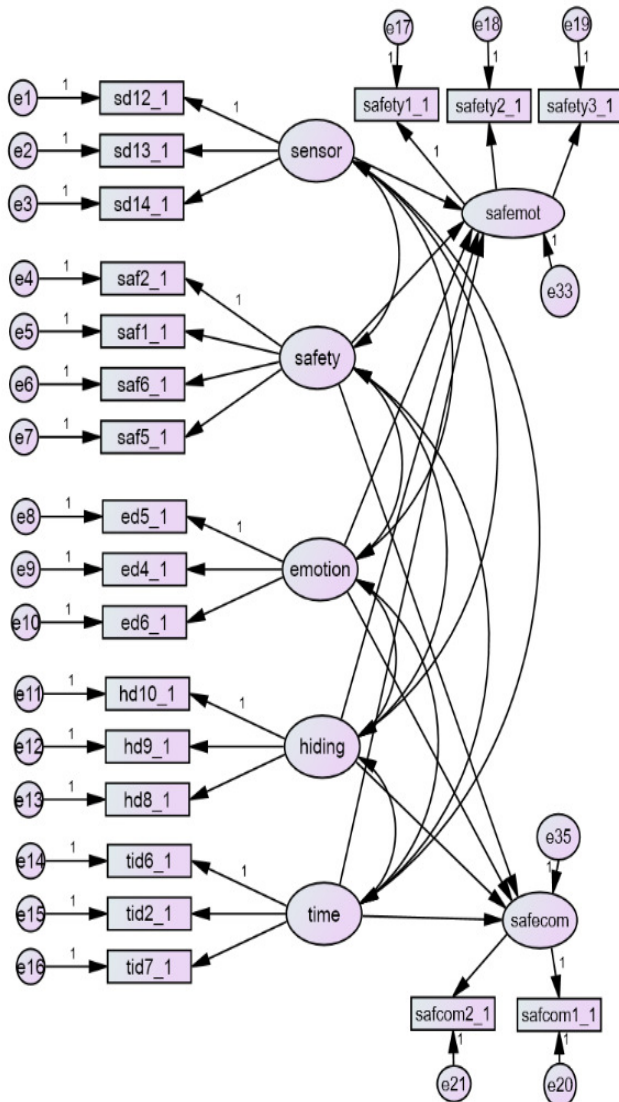
Internal consistency and correlations among the scales
Exploratory Factor Analysis
Factoring analysis (maximum likelihood) with the Promax Rotation method in SPSS, was used to analyse whether the five-factor scales could be distinguished from each other. The Kaiser-Meyer Olkin (KMO) sample was found to be adequate at 0.75. This showed that the data were suitable to run the factoring analysis. Factors that have the eigenvalues of more than

1 were retained. Within these factors, items above 0.40 (35) were retained while factors that consisted of one or two items were deleted. Therefore, from a total of 25 items, eight were deleted. The results showed a distinguished five-factor model of the taxi drivers' job demands instead of the proposed taxi drivers' job demands which had been categorised into two - general demands and specific demands.

Previous research (19,28) had revealed a distinguished scale for the five factors that were being examined in the current study. We found that the five-factor structure explained 51.97% of the variance. The first factor (safety demands) explained 16.84% of the variance which consisted of four items (eigenvalue =3.805), the second factor (sensory demands) explained 17.84% of the variance which consisted of three items (eigenvalue = 3.014), the third factor (emotional demands) explained 8.52% of the variance which consisted of three items (eigenvalue =1.052), the fourth factor (time demands) explained 5.49% of the variance which consisted of four items (eigenvalue = 1.324), and the fifth factor explained 3.28% of the variance (hidden emotional demands) which consisted of three items (eigenvalue =1.025). With regards to reliability, the Cronbach's alpha exceeded 0.70, ranging between 0.71 to 0.84. Parallel form analysis was used as an additional reliability analysis. This was done by using the data taken from a different taxi terminal/station. The Intraclass Correlation Coefficient (ICC) were noted as follows: emotional demands = 0.74, hidden emotional demands = 0.65, sensorial demands = 0.70, time demands = 0.78, and safety demands =0.46. All the ICC values were adequate except for safety demands, and hidden emotional demands. Hence, the results provided a conceptual support and dimension of the taxi drivers' job demands, thereby indicating the more fitting use of the 5-factor structure. Figure 2 illustrates further.
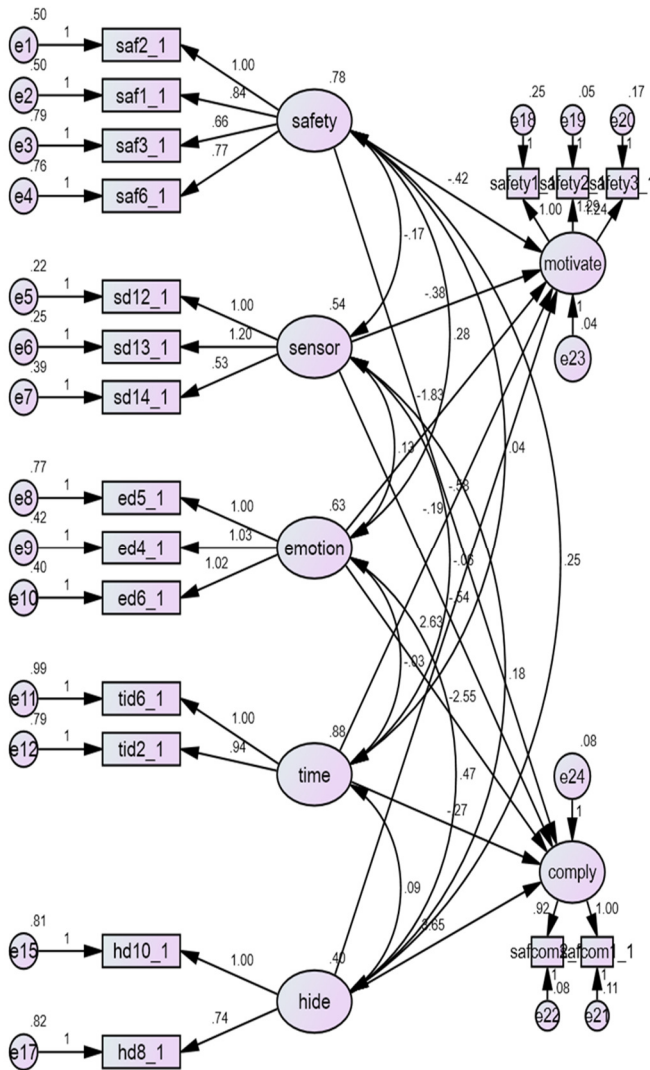
Figure 2: Results

Confirmatory Factor Analysis

To test the hypothesis, we conducted a confirmatory factor analysis using the AMOS software (33). The results showed one set of fit statistics for the overall model (34). We used the Chi-square/df ratio ($\chi2/df$), Goodness-of-fit statistics ($\chi2$), Goodness-of-Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and the Akaike Information Criterion (AIC). According to Byrne (34), the values for the TLI, CFI, and GFI should be 0.90 and above, and values below 0.08 for the RMSEA values would signify a good model fit. The five factor model was then compared using the AIC. The smaller the value of the AIC, the greater the model fit (36). The result of the

Goodness of Fit indices is presented in Table 3. The CFA model presented an acceptable fit to the data ($\chi2$ (333) = 190.23; GFI = 0.94; TLI =0.90; CFI =0.93; RMSEA = 0.07). The AIC also showed a five-factor structure which had the best fit, an unexpected result according to the Job Demand –Resource model (JD-R).

Table 3: Goodness-of-fit indices (N=33)

	$\chi2$	df	GFI	RMSEA	TLI	CFI	CMIN/df	AIC
1-factor	874.12	86	0.74	0.17	0.36	0.54	10.16	974.12
2-factor	587.74	85	0.80	0.13	0.59	0.71	6.92	689.74
3-factor	432.46	83	0.84	0.11	0.71	0.80	5.21	538.46
4-factor	271.14	80	0.90	0.09	0.83	0.89	3.39	383.14
5-factor	190.23	76	0.94	0.07	0.90	0.93	2.50	310.23

Notes: $\chi2$ = goodness-of-fit statistic; GFI = Goodness-of-Fit Index; RMSEA = Root Mean Square Error of Approximation; TLI = Tucker-Lewis Index, CFI = Comparative Fit Index; AIC = Akaike Information Criterion; CMIN/df = minimum discrepancy divided by the degrees of freedom

Two unexpected associations were discovered. The emotional demands had a direct negative effect on safety motivation (β = 1.83, p<0.05) and safety compliance (β = 2.55, p<0.001). Theoretically, emotional demands have a strong influence on the service sectors' performances, such as healthcare employees (37), and teachers (38). In this context, it is possible that the same mechanism may apply whereby taxi driving may also be categorised under the service industry. A similar occupation under this category can be traced to the surgeons' occupation where it was

noted that emotional demands increased their stress levels (39).

Discussion
This study had investigated the psychometric properties of job demands as indicated in the COPSOQ and BDJD-24, by applying them on taxi drivers. The COPSOQ was developed to measure four different job demands: quantitative demands, emotional demands, hidden emotional demands and sensorial demands. In comparison, the BDJD-24 model was utilised to measure three specific demands: time demands, passenger demands, and safety demands.

This study contributes to the existing literature by demonstrating how the COPSOQ instrument and the BDJD-24 measures can be integrated into the job demands scale for assessing taxi drivers' performance. The internal consistency of all the measures was at an adequate level (0.71-0.84) for all the scales. The same range was also noted in the COPSOQ validation studies conducted among Persians, ranging from 0.71-0.80 (40). With regards to the BDJD-24, our study showed a range of 0.72-0.76 which was almost parallel to the range of 0.79-0.82, for the bus drivers in the Netherlands (18).

Although in this study, only the emotional demands showed a significant association with safety performance, the non-significant association between other specific job demands and safety performance (safety motivation and safety compliance) demonstrated that there were some interventions from other factors. It appears that the drivers' adaptive coping strategies (41,42) may alter their perspectives on their work strains, based on the drivers' high and conflicting work demands. This prepares them to adapt to their specific job demands, such as their passengers' demands, time demands, and safety demands. On the other hand, the drivers' emotional demands (general demands) were observed to have a strong association with emotional exhaustion, and depression (17,43). Many factors can be considered with regards to emotional demands among the taxi drivers, such as their varied interactions with passengers (44), or the long working hours that could easily contribute to their emotional sufferings (45). For instance, driving in a confined area for long hours can affect their emotions due to poor ergonomics (46).

Conclusion
In the present study, the first objective was to develop the five-factor structure by adapting items from the COPSOQ and BDJD-24 so as to measure the taxi drivers' job demands. Using the exploratory factor analysis and the confirmatory factor analysis, it was found that the five-factor model had the best fit when compared to the one factor structure or the two factor structure (specific vs. general demands). Reviews from literature had shown that there is no specific scale for measuring job demands for the taxi drivers' occupation, except for one that was previously developed for bus drivers (19). Literature had noted that job demands can highly affect drivers' well-being, and performance, particularly, their safety performance (21,47). The specific scale developed for the taxi drivers may thus assist further research in amplifying similar aspects of job demands such as a taxi driving occupational setting.

The second objective of this study was to examine the association of the job demands to safety performance (safety motivation and safety compliance). From our results, it can be concluded that among the five job demands noted for taxi drivers, their emotional demands had the strongest association with safety motivation and safety compliance. At present, the taxi drivers have yet to find ways to mitigate the adverse effects of their emotional demands, and this in turn, may reduce their safety performance.

Ethics Approval

This research was approved by the ethical committee board of the university (UM.TNC2/RC/H&E/UMREC -105).

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