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Original article

Investigating the Effects of Job Stress on the Distraction and Risky Driving Behaviors of Food Delivery Motorcycle Riders

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ABSTRACT

Background: Occupational safety issues related to food delivery riders emerge with evidence of an increase in associated traffic accidents and injuries along with the rapid growth of the online food delivery business. This paper focuses on food delivery riders' job stress and investigates its relationships with both antecedents and risky riding outcomes.
Method: Survey data were collected from 279 Taiwanese food delivery motorcycle riders and analyzed using hierarchical regression analysis.
Results: The results show that job overload and time pressure positively impact riders' job stress, while self-efficacy slightly reduces job stress. Job stress positively leads to risky driving behavior and distraction. In addition, time pressure can strengthen the impact of job overload on job stress. Riders' risky riding attitude can also strengthen the impacts of job stress on risky riding behaviors and distraction.
Conclusion: This paper advances the literature on online food delivery as well as the occupational safety improvement of food delivery riders. Specifically, this study provides insights into the job stress of food delivery motorcycle riders and the effects of job characteristics and risky behavioral consequences.

1. Introduction

Due to disruptive innovation via information and communications technologies (ICT) and the prevalence of the sharing economy, online-order food delivery services have emerged as a novel business model worldwide. Food delivery riders act as frontline employees for the "last mile link" of the supply to deal with the offline process of delivering foods and others ordered online to customers by mopeds or scooters [1]. The number of food delivery riders is significantly large in several Asian countries. For instance, there are almost 4 million delivery riders employed by Meituan Waimai, a major food delivery company in China [2]. Since the outbreak of coronavirus disease 2019 (COVID-19) in 2020, reliance on food delivery services has rapidly increased, accordingly not only creating more job opportunities but also increasing workload for food delivery drivers as well as increasing infection risk [3]. Along with the vast growth of the online food delivery business, occupational safety issues related to food delivery riders have attracted attention with an increasing trend associated with traffic accidents and injuries. For instance, the percentage of motorcycle riders at fault increased from 31.0% in 2017 to 61.1% in 2020 of all traffic accidents involving food delivery motorcycle riders in Taiwan [4]. Additionally, running red lights and speeding accounted for 81% of all types of traffic violations for delivery motorcycle riders in 2010 in Taiwan [4]. This study is hence motivated to investigate the job stress of food delivery motorcycle riders and its affecting factors of job characteristics and behavioral consequences. Specifically, job stress pertains to the long-term exhaustion from, and diminished interest in, the work undertaken, such as emotional exhaustion, burnout, or fatigue. Job stress has been found to be significantly related to the preference for risky driving among professional drivers [6,23]. To reflect the working condition of completing many delivery tasks in a limited time, we consider both job overload and time pressure as the dimensions of job demands. Self-efficacy is operationalized to represent riders' personal resources with respect to positive self-evaluations to control the working conditions and to reduce job stress. Risky driving behavior and distraction are examined as the two behavioral consequences of job stress.

Unlike the specific driving license requirement for professional drivers, being a delivery rider simply requires a valid driver license

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and access to a vehicle and a smartphone. The delivery task is assigned by the delivery company's dedicated app, which is installed on the rider's smartphone to manage orders. The job of food delivery rider is basically a type of temporary work, and rider remuneration is based on the number of delivery tasks completed instead of a fixed rate (weekly/monthly) or the number of hours spent on the job. Delivery riders by large do not receive professional driving training to hold professional driving licenses. When receiving a delivery task from the dispatching app, delivery riders ride to the restaurant to fetch the food ordered and then deliver to the assigned location within the required time. The locations of origin and destination riders encounter are frequently dynamic and unfamiliar, resulting in riders' heavy reliance on Global Positioning System mapping guidance during the delivery process.

To earn more money by taking more delivery tasks and completing their delivery tasks in time to avoid the hefty delay fines imposed by companies, the job characteristics of delivery riders reflect several dimensions of job demands, such as job overload and time pressure, frequently identified in job demand-resources (JD-R) theory [5]. The JD-R model has been widely applied to investigate job stress and motivation in work and organizational psychology research. Job demands and job resources are the two factors that function in working conditions. Job demands pertain to those "physical, social, or organizational aspects of the job that require sustained physical or mental effort and are, therefore, associated with certain physiological and psychological costs (e.g., exhaustion)" [5], whereas job resources refer to those physical, psychological, social, or organizational characteristics of the job that can help to achieve work goals, mitigate job demands, and enhance personal or development [5]. The job demands as stressors are then likely to cause rider's job stress represented by burnout [6] and further counterproductive outcomes or risky driving behaviors such as speeding, running red lights, using mobile phones and way finding while riding, and distraction [2,6–10]. During the COVID-19 pandemic period, delivery riders still have to work longer hours to complete a dramatic increase in delivery tasks due to protective measures of lockdown, stay at home, and quarantine and are exposed themselves to extra health and safety risks. Hence, delivery riders using motorcycles or e-bicycles belong to a vulnerable group who are physically demanding and mentally stressed under a precarious working environment [1].

Previous studies point out great differences in travel psychology, travel behavior, and risk taking between delivery riders and ordinary riders [11,12]. Since they are exposed to relatively long-term delivery riding [12] and job characteristics [6], delivery riders are at greater risk of accidents because of their physiological vulnerability than motor vehicle occupants as well as their induced risky riding behaviors [10]. However, to the best of our knowledge, no previous research has shed light on delivery riders' risky riding behaviors from the perspectives of job stress and job demands, which motivates this study to fill this research gap. In this study, as shown in Fig. 1, we examine the effects of job stress antecedents associated with job characteristics (i.e., job overload and time pressure), personal resources (i.e., self-efficacy), and two risky behavioral consequences (i.e., risky driving and distraction). Additionally, we examine the moderating effects of risky driving attitude, which is a predictor of risky driving behavior [13], on the relationship between job stress and risky behavioral consequences. Hence, the following hypotheses are proposed:

H1. Job overload is positively related to job stress.

H2. Time pressure is positively related to job stress.

H3. Self-efficacy is positively related to job stress.

H4. ob stress is positively related to risky driving behavior.

H4. Job stress is positively related to distraction.

H5. Risky driving attitude moderates between job stress and risky driving behavior.

H6. Risky driving attitude moderates between job stress and distraction.

2. Methods

2.1. Participants and procedure

We collect data from food delivery motorcycle riders through an online survey carried out in November 2021. Note that there were COVID-related restrictions still in place in Taiwan during the survey period. The survey was implemented in compliance with institutional guidelines. A survey participation advertisement was posted on several online social communities related to food delivery motorcyclists via Facebook and LINE to invite potential respondents to participate. A cover letter of the questionnaire states the research purpose, and the participants were ensured about their anonymity, the right to stop participating at any time and that there were no right or wrong answers. Once completing the survey, the respondents were

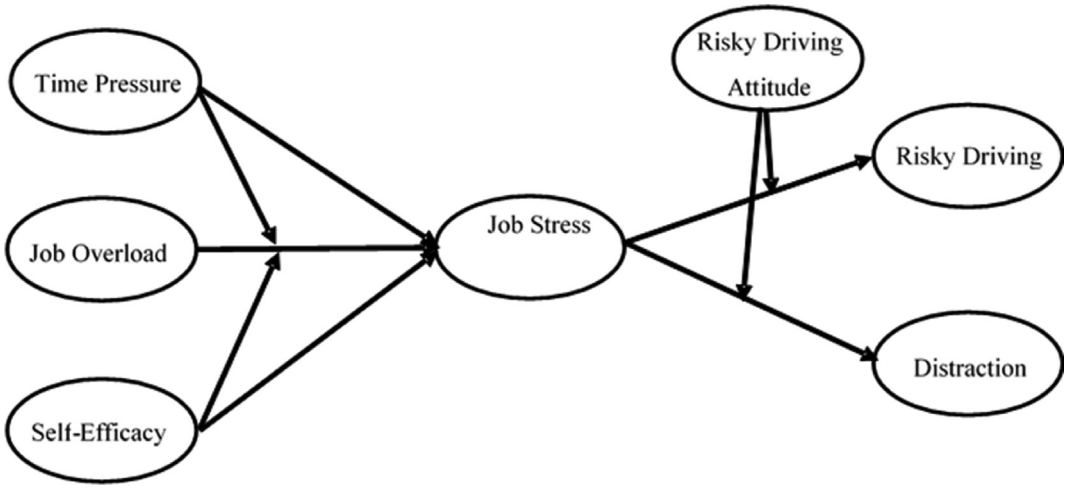

Fig. 1. Research model.

offered a lottery gift card of NT$100 (approximately US$ 3.3). It took approximately 10 mins for a respondent to complete the questionnaire. To confirm the content validity of the questionnaire, a pretest with 30 food delivery motorcycle riders was conducted, and wording changes were made accordingly.

In total, 315 responses were recorded on SurveyCake, of which 279 responses were completed with valid information. Table 1 presents the demographic characteristics and working characteristics of the respondents. The sample consisted of 206 males and 73 females. The majority of respondents were aged 31–50 years, followed by those aged 21–30 years (13%), with an average driving experience of 12.37 years (standard deviation, SD = 7.79) since receipt of their driver's license. Most of the respondents (67%) worked as part-time employees, with an average daily working hour of 6.32 hours (SD = 3.58) and working experience of 8.34 months (SD = 7.60). Most of the respondents (76%) reported that they had not experienced any accidents.

2.2. Measures

We adopted existing scales with established reliability and validity to measure all constructs of the conceptual model. Modifications are made to the wording to suit the study context. All measurement items are measured by using a 5-point Likert-type scale, ranging from 'strongly disagree (=1)' to 'strongly agree (=5)'. The scales were originally prepared in English and then translated into the local language (Chinese) guided by the translation and back-translation approach [37].

2.2.1. Job overload

Job overload is measured by five items adapted from Van den Oetelaar et al. [14]. A sample item is "Having too much work to do." The reliability value (*Cronbach's* α) is 0.76.

2.2.2. Time pressure

We measured time pressure using five items adopted from Putrevu and Ratchford [15]. A sample example item is "Feeling high time pressure at work." The *Cronbach's* α is 0.86.

2.2.3. Self-efficacy

Self-efficacy is defined as an individual's comprehensive judgment about one's capability or ability to meet situational demands and perform a certain task, i.e., food delivery by riding motorcycle in our study context. It is measured by four items adapted from Renn and Fedor [16]. An example item is "Feeling confident about my ability to perform my job." The *Cronbach's* α is 0.88.

Table 1
Sample profile

Categorical variables		Frequency	Percentage
Gender			
	Male	206	74%
	Female	73	26%
Age			
	18–20	8	7%
	21–30	133	13%
	31–40	99	20%
	41–50	34	27%
	Over 51	5	3%
Job type			
	Full time	72	33%
	Prat time	207	67%
Continuous variables		**Mean**	**Standard deviation**
Driving license (in years)		12.37	7.97
Daily working hours (in hours)		6.32	3.58
Delivery job experience (in years)		8.34	7.60

2.2.4. Job stress

Job stress is measured by a five-item scale of emotional exhaustion adapted from Maslach, Jackson &Leiter [17], which is the central quality and the most obvious manifestation of burnout [18]. A sample item is "Feeling emotionally drained from my work." The *Cronbach's* α is 0.89.

2.2.5. Risky driving behavior

We measure risky driving by using the six-item scale adopted from Zheng et al. [6]. A sample item is "How often do you ride in a fast lane that is prohibited during work time?". The Cronbach's α is 0.78.

2.2.6. Distraction

Distraction during riding was measured using seven items from Zhang et al. [10]. A sample item is "Initiating a call". The Cronbach's α is 0.79.

2.2.7. Risky driving attitude

Risky driving attitude is measured by four items from Chen [13]. A sample item is "There are many traffic rules which cannot be obeyed in order to keep up the traffic flow." The Cronbach's α is 0.84.

2.2.8. Control variables

Gender, age, and working time were introduced as control variables due to their influence on job stress and driving behavior. Gender was measured by a dichotomous scale, while age and working time were measured by an ordinal categorical scale.

2.3. Data analysis

We conducted multiple hierarchical regression analyses in four steps to examine (1) the effects of time pressure, job overload, self-efficacy and their interactions on job stress, (2) the moderating effect of risky driving attitude between job stress and risky driving behavior, and (3) the moderating effect of risky driving attitude between job stress and distraction.

3. Results

3.1. Reliability and validity assessment

Table 2 presents the means, standard deviations, reliability estimates, and correlation coefficients of all constructs and demographic characteristics, including age, gender, and driving experience. The reliability of all scales is satisfactory, with Cronbach α values ranging from 0.76 to 0.89. As shown in Table 3, there are significant positive correlations between job overload and job stress ($r = 0.48$, $p < 0.01$) and between time pressure and job stress ($r = 0.57$, $p < 0.01$), while the correlation between self-efficacy and job stress is negative ($r = -0.22$, $p < 0.01$), consistent with our hypothetical expectation. The correlations between job stress and risky driving ($r = 0.22$, $p < 0.01$) and between burnout and distraction ($r = 0.30$, $p < 0.01$) are significantly positive. Risky driving attitude is found to significantly and positively correlate with risky driving ($r = 0.55$, $p < 0.01$) as well as distraction ($r = 0.38$, $p < 0.01$). It is also worth noting that the correlation between job overload and time pressure is high ($r = 0.69$, $p < 0.01$), reflecting that the job characteristic of food delivery riders belongs to the kind of job with many delivery tasks required to be carried out under a time constraint.

Table 2
Means, SD, and correlations of variables

Variables	M	SD	1	2	3	4	5	6	7	8	9	10
1. Age (years)	31.88	7.99	—									
2. Gender (male = 1, female = 2)	1.26	0.44	−0.11	—								
3. Driving experience	8.34	7.60	0.10	0.08	—							
4. Job overload	3.34	0.70	−0.06	0.12	0.05	***0.76***						
5. Time pressure	3.28	0.84	−0.03	0.14	−0.01	0.69	***0.86***					
6. Self-efficacy	4.29	0.59	−0.14	0.04	0.09	−0.07	−0.25	***0.88***				
7. Job stress	3.05	0.86	0.04	−0.05	0.07	0.48	0.57	−0.22	***0.89***			
8. Risk driving attitude	2.91	1.08	−0.09	−0.08	−0.01	0.28	0.27	0.02	0.22	***0.84***		
9. Risky driving	2.64	0.96	−0.10	−0.12	0.07	0.23	0.26	0.06	0.22	0.55	***0.78***	
10. Distraction	2.65	0.78	0.00	−0.09	0.06	0.25	0.31	0.02	0.30	0.38	0.62	***0.79***

Note: Diagonal values in the table are internal reliability.
SD, standard deviation.

Table 3
The effects of job overload, time pressure, and self-efficacy on job stress

Variables	Model 1		Model 2		Model 3		Model 4	
	β	SE	*β*	SE	*β*	SE	*β*	SE
Gender	−0.07	0.12	−0.11	0.10	−0.08	0.10	−0.08	0.10
Age	−0.04	0.07	−0.10*	0.06	−0.14**	0.05	−0.13**	0.05
Working time	0.01	0.04	−0.02	0.03	−0.01	0.03	−0.01	0.03
Job overload (JO)			0.44**	0.05	0.17**	0.06	0.17**	0.06
Time pressure (TP)					0.38**	0.06	0.38**	0.06
Self-efficacy (SE)					−0.07*	0.04	−0.08*	0.04
JOxTP							0.08**	0.04
JOxSE							−0.01	0.04
R^2	0.01		0.25		0.37		0.38	
F value	0.33		22.57**		26.57**		20.76**	
R^2 change	—		0.24		0.12		0.01	

Note: *denotes $p < 0.05$; **denotes $p < 0.01$.

3.2. Effects of job overload, time pressure and self-efficacy on job stress

We examined the effects of job overload, time pressure, and self-efficacy on job stress through hierarchical regression analysis [19]. As shown in Table 3, three control variables, including gender, age, and working time, are estimated in step 1 (Model 1), followed by entering job overload as the core factor in step 2 (Model 2) and both time pressure and self-efficacy in step 3 (Model 3) to estimate their main effects on burnout. Finally, two interaction terms, namely, job overload* time pressure (JQxTP) and job overload*self-efficacy (JOxSE), in step 4 (Model 4) are included to explore the moderating effect on the relationship between job overload and job stress The results indicate that the main effect of job overload on job stress ($\beta = 0.44$) is significantly positive in Model 2, while the effect turns to a lesser extent ($\beta = 0.17$) when considering both time pressure and self-efficacy in Model 3. In other words, positive effects of job overload ($\beta = 0.17$) and time pressure ($\beta = 0.38$) on job stress are significantly evident, while the effect of self-efficacy is found to be significantly negative ($\beta = -0.07$). To examine the moderation effects, the values of job overload, time pressure, and self-efficacy are standardized to produce the product terms used in Model 4. Only the positive effect of JOxTP ($\beta = 0.08$) is found to be significant, indicating that the influence of job overload on job stress is strengthened by the level of time pressure. We followed Aiken and West's [20] procedures to conduct a slope analysis and plot the moderation effect at the lower (−1 SD) and higher (+1 SD) levels of both job overload and time pressure, as shown in Fig. 2. The figure shows that the effect of job overload on burnout is stronger at higher levels of time pressure than at lower levels of time pressure.

3.3. The effects of job stress and risky driving attitude on risky driving behavior

Table 4 presents the effects of job stress and risky driving attitudes on risky driving behavior as well as the moderation effect of risky driving attitude on risky driving behavior. The control variables, i.e., gender ($\beta = 0.22$), age ($\beta = -0.19$), and working time ($\beta = 0.12$), have significant effects on risky driving behavior in Model 1. The main effects of job stress ($\beta = 0.11$) and risky driving attitude ($\beta = 0.47$) on risky driving behavior are found to be significantly positive after controlling for the influences of gender, age, and working time in Model 3. It is noteworthy that risky driving attitude ($\beta = 0.46$) impacts risky driving behavior much more than burnout ($\beta = 0.01$). RDAxJS ($\beta = 0.13$) in Model 4 is significantly positive, indicating that an increase in risky driving behavior is caused by the interplay between job stress and risky driving attitude. The influence of job stress on risky driving behavior is stronger for motorcycle riders with higher risky attitudes than for those with lower risky attitudes (see Fig. 3).

3.4. The effects of job stress and risky driving attitude on distraction

Table 5 reports the effects of job stress and risky driving attitudes on distraction as well as the moderation effect of risky driving attitude on distraction. In Model 1, working time has a significantly

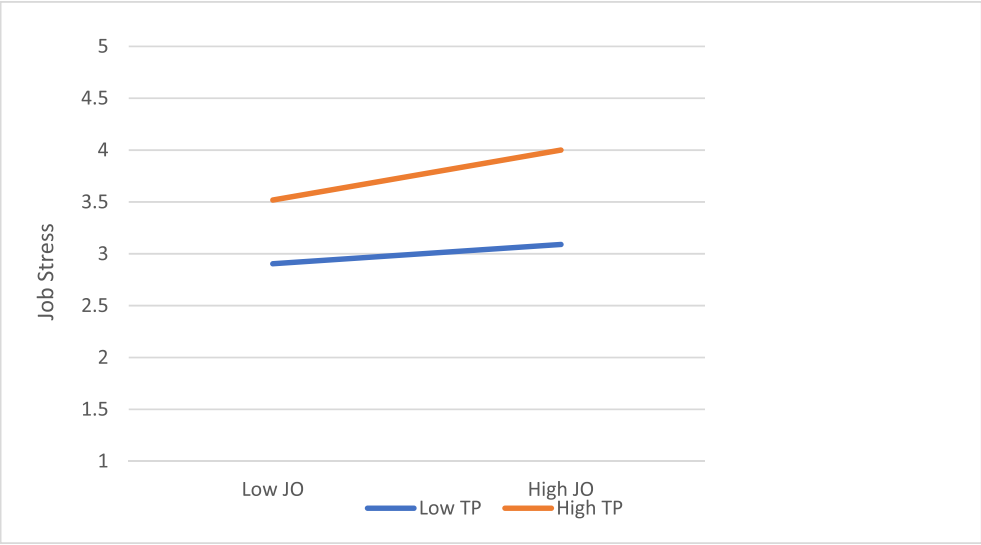

Fig. 2. The effect of the interaction between time pressure and job overload on job stress.

Table 4
The effects of job stress and risky driving attitude on risky driving behavior

Variables	Model 1		Model 2		Model 3		Model 4	
	β	SE	β	SE	β	SE	β	SE
Gender	0.22*	0.128	0.24*	0.13	0.13	0.11	0.14	0.11
Age	−0.19**	0.071	−0.18**	0.07	−0.12**	0.06	−0.14**	0.06
Working time	0.12**	0.038	0.12**	0.04	0.07**	0.03	0.07**	0.03
Job stress (JS)			0.21**	0.06	0.11**	0.05	0.09*	0.05
Risky diving attitude (RDA)					0.47**	0.05	0.46**	0.05
RDA×JS							0.13**	0.05
R^2	0.06		0.11		0.33		0.35	
F value	6.19**		8.54**		27.00**		24.51**	
R^2 change	0.06		0.05		0.22		0.02	

Note: *denotes $p < 0.05$; **denotes $p < 0.01$.

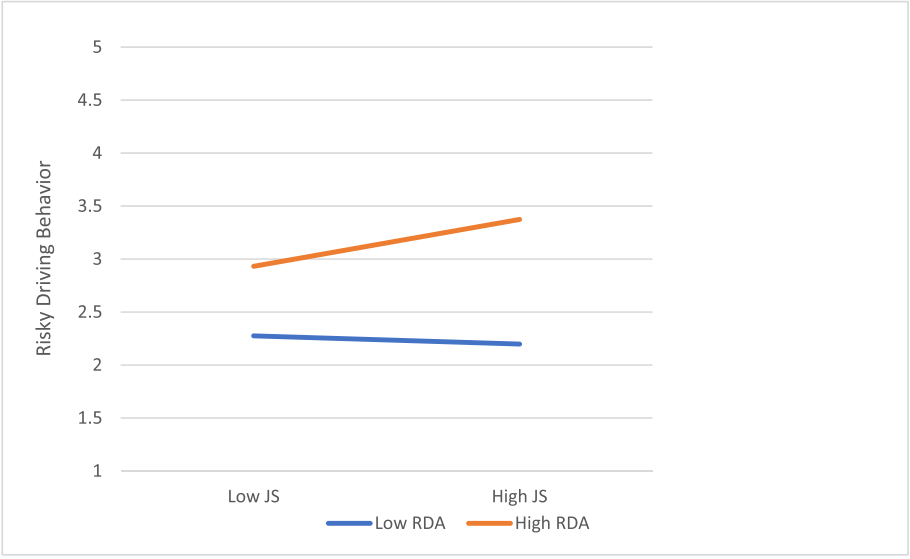

Fig. 3. The effects of the interaction between job stress and risky driving attitude on risky driving.

Table 5
The effects of job stress and risky driving attitude on distraction

Variables	Model 1		Model 2		Model 3		Model 4	
	β	SE	β	SE	β	SE	β	SE
Gender	−0.01	0.11	0.02*	0.10	−0.04	0.10	−0.04	0.10
Age	−0.10*	0.06	−0.09	0.06	−0.06	0.05	−0.07	0.05
Working time	0.07**	0.03	0.07**	0.03	0.05*	0.03	0.05*	0.03
Job stress (JS)			0.23**	0.05	0.18**	0.04	0.16**	0.04
Risky diving attitude (RDA)					0.24**	0.05	0.24**	0.04
RDA×JS							0.09**	0.04
R^2	0.03		0.11		0.20		0.22	
F value	2.54		8.589**		13.61**		12.41**	
R^2 change	—		0.08		0.09		0.02	

Note: *denotes $p < 0.05$; **denotes $p < 0.01$.

positive effect on distraction (β = 0.07), while the effect of age is moderately negative (β = −0.10). The main effects of burnout (β = 0.18) and risky driving attitude (β = 0.24) on distraction are significantly positive after considering the impacts of control variables in Model 3. Note that risky driving attitude has a higher impact than job stress on distraction. RDAxJS (β = 0.09) on distraction is significantly positive in Model 4, indicating that the influence of job stress on distraction is stronger for motorcycle riders with higher risk attitudes than for those with lower risk attitudes (Fig. 4).

4. Discussion

Food delivery services have emerged as a prevailing first/last mile logistics service in urban areas under the circumstance of the COVID-19 pandemic. While there remains a vast gap in understanding delivery riders' psychology and behaviors, this study makes several contributions to research. By integrating theories from job stress, job characteristics, and occupational safety, this is the first study investigating the relationships between job demands, personal resources, job stress, and risky driving behaviors in a gig economy context. This study addressed the job stress of food delivery motorcycle riders and investigated the effects of job characteristics and risky behavioral consequences. Three job characteristics relevant to food delivery motorcycle riders and two risky behavioral consequences are considered in our job stress model. In addition, the moderation effect of riders' risky driving attitudes is considered for the impact of job stress on risky behavioral consequences.

First, this study sheds light on the unique job characteristics of food delivery motorcycle riders and their effects on job stress. As expected, work overload and time pressure have positive impacts on riders' job stress, while riders' self-efficacy slightly reduces job stress. Time pressure is the strongest predictor of job stress, implying the unique job characteristic of working under a high degree of time pressure in the context of food delivery riders. Previous studies also confirm that time pressure becomes a crucial factor among drivers to report higher quantitative job demands and work intensification and leads to higher job stress (burnout) [21]. The time pressure of delivery motorcycle riders might be caused by strict deadlines for each delivery task, penalties for late deliveries, and even quantitative workloads [6,9]. In general, a delivery rider can earn approximately NT$70 (US$2.33) and complete 3.5 orders per hour on average in Taiwan. The common late delivery penalty for each order could be worth NT$ 30-50 or be suspended for temporary order assignment. The limited effect of riders' self-efficacy on mitigating job stress implies that personal resources are not sufficient to cope well with the derived job

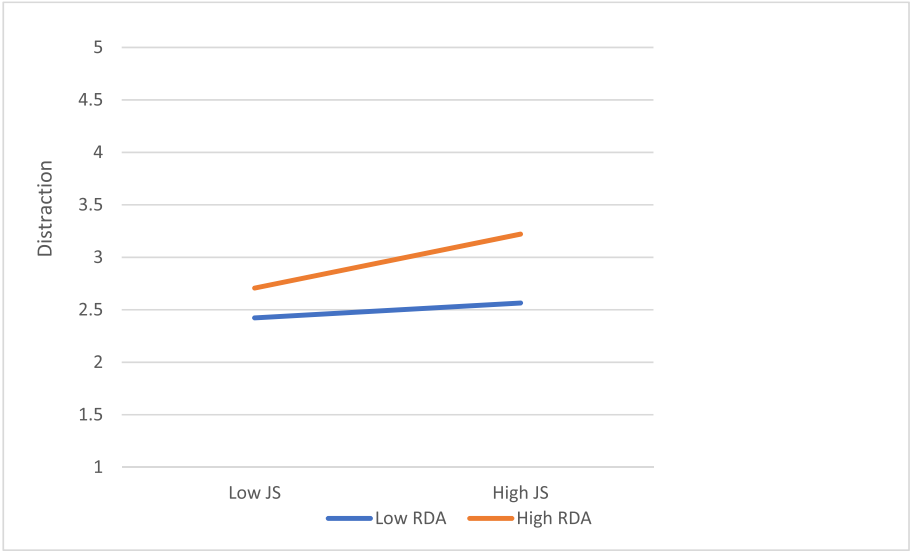

Fig. 4. The effects of the interaction between job stress and risky driving attitude on distraction.

stress given the working conditions of job overload and time pressure motorcycle riders encounter. Given a level of riders' job overload, regardless of high or low degree, self-efficacy is not sufficient to buffer the positive effect on job stress caused by job overload. However, the significant interaction effect demonstrates that riders' job stress is strengthened when motorcycle riders feel time pressure to complete a large number of delivery orders. Remedies to effectively manage job stress might seek online food delivery companies to scrutinize and improve their dispatching mechanism and assignment-based pay schemes and reduce or remove penalties for late deliveries. In addition, job resources such as organizational support, which can make employees effectively cope with job stress according to the JD-R model [5], are relatively lacking in the current online food delivery context and hence call for delivery companies and authorities (governments) to consider associated investments in job resource offerings. According to Demerouti et al. [5], job resources are about physical, social, or organizational aspects of the job that help employees cope with difficult problems and support them to mitigate the negative impacts triggered by job demands. Hence, providing a high level of support from the organization, such as offering traffic safety education training or creating a psychology safety climate within companies [21], could be an important resource that delivery motorcycle riders currently lack and could benefit from.

Second, job stress leads to risky driving behavior and distraction. This finding is consistent with previous studies supporting the association between job stress and employees' negative well-being (such as poor physical and mental health), counterproductive job performance and occupational safety [8,22–29]. An individual feeling emotional stress is more inclined to take riskier action [30]. The risky or aberrant behaviors induced by drivers' stress include aggressive driving, specific scenario tension, dislike of driving [31], and less likelihood of using safety devices [30] and are related to traffic fines [32]. Stress is also detrimental to the intention-based allocation of attention, such as riding or driving, and leads to rider distraction, a common cause of riding (driving) errors and traffic accidents. Previous studies highlight the role of job stress for delivery riders in shaping their well-being given the working environment under a high degree of job overload and time pressure. Hence, receiving special riding training to prevent aggressive riding behavior [33] is important.

Third, risky riding attitude strengthens the positive impact of job stress on risky driving behavior and distraction. Risky driving attitude pertains to a rider's intention to evaluate risky riding behavior (such as using mobile phones while riding, using the wrong lane, speeding and running red lights, etc.) with some degree of favorableness or non-favorableness. Specifically, riders with a higher degree of risky driving attitude are more likely to perceive risky driving behavior as acceptable and preferrable. Compared to riders with a low degree of risky driving attitude, riders with a high degree of risky driving attitude are more inclined to engage in risky driving behavior and distraction under the circumstance of high job stress. The positive, direct impacts of risky driving attitude on risky driving behavior and distraction also align with previous studies [13,34]. Hence, more attention should be given to attitude change in terms of risky driving for delivery riders. In particular, using mobile phones while riding is distracted and risky, frequently occurring and posing a major risk for delivery riders. Using news narratives through narrative engagement [35] might be one useful strategy to stigmatize distracted or risky riding behavior and dimmish attitudes toward distracted riding or risky riding. Further research efforts on designing effective intervention strategies for attitude change in risky or distracted riding are recommended.

4.1. Research limitations and future research

This study has several limitations with exceptions and hence provides potential research directions for further investigations. First, the data collected and analyzed in the current study are limited to one country (i.e., Taiwan), and the results should not directly apply to other research contexts, particularly with different food delivery business topologies and traffic environments [6–11]. However, comparative studies from various research contexts are encouraged to provide a more comprehensive understanding of job characteristics, job stress, and risky driving behaviors for food delivery riders. Second, only personal resources, i.e., self-efficacy, but not job resources offered by companies, are considered. Future studies can consider the role of job resources such as organizational support or cowork support, if applicable, in alleviating job stress caused by delivery riders' job overload and time pressure. Personality or personal traits are identified in the related literature as an important factor affecting job stress [23] and aberrant riding behaviors [13,36]. Future investigations can obtain deeper insights including the role of personality. Third, according to the JD-R model [5], burnout is a more comprehensive construct of job stress that includes three components [17]: emotional exhaustion (i.e., the feeling of overwhelming emotions at work), depersonalization (i.e., detachment from others or indifference at work), and reduced professional accomplishment (i.e., detachment from others or indifference at work). We recommend that future studies consider all three dimensions of burnout to depict the whole picture of food delivery riders' job stress. Finally, future research is also recommended to investigate coping strategies such as problem-focused coping to change person-environment transactions or emotional-based coping to regulate emotions [26] adopted by delivery riders to respond to stressful situations.

This study sheds light on the antecedents and consequences of job stress for food delivery motorcycle riders. Complementary to previous studies on food delivery riders who use e-bikes, the findings of this study confirmed that job overload and time pressure positively impact riders' job stress, while self-efficacy slightly reduces job stress. Job stress is positively related to risky driving behavior and distraction. Time pressure strengthens the impact of job overload on job stress. Riders' risky riding attitude strengthens the impact of job stress on risky riding behaviors. This paper advances the literature on online food delivery as well as the occupational safety improvement of food delivery riders. The findings of this study provide directions for the job design and well-being of food delivery motorcycle riders and for developing better countermeasures for riders' traffic safety.

Conflicts of interest

All authors have no conflict of interest.

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