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Relationship between Negative Work Situation, Work-Family Conflict, Sleep-Related Problems, and Job Dissatisfaction in the Truck Drivers

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Abstract: Understanding the relationship between psychological factors of truck drivers is very important for accident prevention plans. This study investigates whether the negative work situation or work-family conflict positively affects sleep-related problems and whether sleep-related problems positively affect job dissatisfaction. The relationship was verified by structural equation modeling. The analysis was conducted with 184 truck drivers who drive daily from the 5th Korea Working Conditions Survey (KWCS) data. The structural equation modeling results found that work-family conflict (standardized path coefficient = 0.274) and negative work situation (standardized path coefficient = 0.203) had significantly affected sleep-related problems. Also, the sleep-related problems were more affected by the work-family conflict level than the negative work situation level. Sleep-related problems were found to correlate with job dissatisfaction (standardized path coefficient = 0.336). The relationship between negative work situation and work-family conflict on sleep-related problems and job dissatisfaction will help establish preventive policies for truck drivers' safety and health.

Keywords: structural equation modeling; work-life balance; safety and health; job satisfaction

1. Introduction

1.1. Truck Drivers and Purpose of Study

Truck drivers who transport cargo to a local region or long-haul area play a role in the e-commerce and logistics industries [1]. In Korea Standard Classification of Occupations [2], truck and special truck drivers are classified into freight-vehicle drivers and special-purpose-vehicle drivers. Freight-vehicle is defined as a truck whose loaded weight is larger than the total weight of passengers inside, and a special-purpose-vehicle is a vehicle that is adequately designed to perform particular tasks [3]. In this study, truck drivers include freight-vehicle drivers and special-purpose-vehicle drivers. In 2018, there were 1,235,045 workers at 383,737 establishments in the freight trucking industry of South Korea [4].

Truck drivers' tasks include checking the transport records and delivering the vehicle to its destinations [1]. Truck drivers are treated as self-employed in South Korea [1]. Some self-employed truck drivers buy or lease trucks and go into business for themselves [1]. Truck drivers who are self-employed can control the number of workdays and their schedules. Truck drivers can maintain their income by long working hours because of intensified competition [5]. Self-employed truck drivers who purchase cars as installments are subject to economic pressure due to car payments and tend to increase workdays to increase their monthly income. They often have to drive until the late hours of the night, and they may experience irregular and insufficient meals [5].

Furthermore, large truck drivers may be away home for days or weeks, leading to insufficient sleep [6]. Lee and Jeong [1] pointed out that it is necessary to support truck drivers' chronic fatigue to prevent crashes caused by drowsy driving. Thus, truck driver is recognized as an occupation with the highest rates of injuries and illnesses [6,7].

Truck drivers may experience prolonged sitting and be exposed to many unhealthy conditions such as long driving distances, irregular shifts, insufficient rest, fatigue, and environmental hazards [6,8]. The drivers also have a stressful nature of work—tight timelines, congested roads, customers' rude behavior, the direct relationship of hours of work and incentives, and not enough time for relaxation [1,9].

Human-related factors caused 73.8% of the crashes in an analysis of tank truck crashes [10]. Human-related factors can be categorized into driver's properties [11], organizational factors [12], and direct causes of the crash (such as drowsy driving, inattention, and violation) [13]. These human-related factors are primarily associated with psychophysiological stressors, and psychophysiological stressors increase the likelihood of aggressive driving and poor mental health outcomes [14]. Thus, understanding the relationship between psychological factors is very important for accident prevention plans.

Psychological factors related to truck drivers include work situation, work-family conflict (or work-family balance), sleep-related problems, and job satisfaction [7–9,13–21]. Previous studies suggested that truck drivers' psychological factors were related to incidents [17–21]. However, there are a lack of studies analyzing the structural relationship between work situations, work-life balance, sleep-related problems, and job satisfaction.

This study aims to understand the factors influencing sleep-related problems and job dissatisfaction among truck drivers. A structural equation model combining the previous studies was performed to test three hypotheses on the relationships between negative working situations, work-family conflicts, sleep-related problems, and job dissatisfaction.

1.2. Theoretical Background and Hypotheses

1.2.1. Sleep-Related Problems

Driver drowsiness is common among truck drivers working extended hours [6,9,13]. Truck drivers suffer from sleep-related problems more than the general population [22]. Long working hours and unpredictable schedules are related to sleep problems [23,24]. Sleep-related problems increase risks for incidents and injuries [1,18–20,25]. Drowsiness was involved in 10.5% of the delivery truck crashes in South Korea [5]. These risks affect the profitability of the transportation company, medical costs for health insurance, and ultimately public safety [21].

1.2.2. Work Situation

The work situation is the social relationships that workers enter into their workplace [26]. It is related to the work environment, employment conditions, and employee's satisfaction [27]. It also includes individual rights and professional development opportunities within the company [28]. The truck driver's working conditions still are not good, and negative work situations are common [1,5]. In this study, negative work situations mean unfortunate or hostile social relationships that workers experience in their workplace. The negative work situation in the workplace saps energy and diverts attention from productivity and performance [20]. It can also lead to poor mental health outcomes, especially sleep-related problems.

This research created the following hypotheses:

Hypothesis 1 (H1): *Negative work situations positively affect sleep-related problems.*

1.2.3. Work-Family Conflict

Extended driving hours and irregular schedules can reduce the likelihood of family spending and lead to work-family conflict. Work-family conflict is the degree to which workers are not satisfied with

the role of work and family: time-sharing, involvement, and satisfaction with work and family [16,17]. One primary reason for the work-family conflict is the lack of time-sharing due to extended driving hours [17]. Work-life conflict, social isolation, or unfortunate work situations can intrude into workers' private lives, leading to sleep-related problems [17,18].

As explained in the literature above, this study hypothesized:

Hypothesis 2 (H2): *Work-family conflicts positively affect sleep-related problems.*

1.2.4. Job Satisfaction

Job satisfaction can be defined as the subjective interpretation of individual opinion based on the extent of fulfilling their requirements at work and in work situations, relationships, or activities related to it [26,27]. It also refers to a personal attitude, such as the overall impression, feeling, and evaluation that an individual has about the job. In this study, job dissatisfaction means the negative attitude or evaluation that workers have about the job. Job dissatisfaction can lead to negative outcomes [29]. Truck drivers suffer from sleep-related problems, and job dissatisfaction is common [13,19,21,25]. Sleep-related problems can cause a truck driver's job dissatisfaction. Thus, this research created the following hypotheses:

Hypothesis 3 (H3): *Sleep-related problems positively affect job dissatisfaction.*

2. Materials and Methods

2.1. Data Collection

This study used data and questionnaires from the 5th Korea Working Conditions Survey (KWCS) in 2017. KWCS is a national survey to investigate workers' working conditions and risk factors by industry [30]. The questionnaire used in this study is identical to that of the 6th European Working Conditions Survey (EWCS) [31]. The raw data of the KWCS was received from the Institute for Occupational Safety and Health [30].

In the 5th KWCS, 50,205 workers participated in proportion to each region's population in South Korea. Among them, drivers in the freight trucking industry were selected as this study's subjects. A total of 184 professional truck drivers were extracted as the final data. All of them were male, with 11.4% of those ≥ 60 years, and 38.6% of those in their 50s. The mean of driver's age was 54.9 years, with a standard deviation of 9.40.

2.2. Research Variables

The research variables consisted of latent variables for a negative work situation, work-family conflict, sleep-related problems, and job dissatisfaction. Table 1 shows the latent variables and measurement variables for each latent variable. As shown in Table 1, all measurement variables were scored to the Likert scaling from 1 to 5.

Negative work situation was based on the Q49 questions of the 2017 KWCS questionnaire (same as Q61 questions of the 2015 EWCS questionnaire) [31]. Some of the Q49 measurement variables in the KWCS questionnaire were removed through prior reliability analysis. The measurement variables for the negative work situations in Table 1 represent the results after prior removal.

Work-family conflict was represented by the Q38 questions of the 2017 KWCS questionnaire (same as Q45 questions of the 2015 EWCS questionnaire). As shown in Table 1, these questions have five measurement variables on work-family conflict [31].

Sleep-related problems were represented by the Q63 questions of the 2017 KWCS questionnaire (same as Q79 questions of the 2015 EWCS questionnaire). As shown in Table 1, these questions have three measurement variables on sleep-related problems [18].

Job dissatisfaction was based on the Q71 questions of the 2017 KWCS questionnaire (same as Q90 questions of the 2015 EWCS questionnaire). As shown in Table 1, it is the same as Warr et al.'s job dissatisfaction index [32].

Table 1. Research variables of this study.

Latent Variable	Selected Measurement Variable	Variable Abbreviation	Description and Score
Negative work situation	You can take a break when you wish	WS1	1.Always ~5.Never
	You have enough time to get the job done	WS2	
	Your job gives you the feeling of work well done	WS3	
	You are able to apply your own ideas in your work	WS4	
	You have the feeling of doing useful work	WS5	
	You know what is expected of you at work	WS6	
Work-family conflict	Worry about work when not working	F1	1.Never ~5.Always
	Too tired after work to do household work	F2	
	Job prevents giving time to family	F3	
	Hard to concentrate on job because of family	F4	
	Family prevents giving time to job	F5	
Sleep-related problems	Difficulty falling asleep	S1	1.Never ~5.Daily
	Waking up repeatedly during the sleep	S2	
	Waking up with a feeling of exhaustion and fatigue	S3	
Job dissatisfaction	At my work I feel full of energy	J1	1.Always ~5.Never
	I am enthusiastic about my job	J2	
	Time flies when I am working	J3	
	In my opinion, I am good at my job	J4	
	I feel exhausted at the end of the working day	J5	1.Never ~5.Always
	I doubt the importance of my work	J6	

2.3. Data Analysis and Structural Equation Model

This study proposed hypotheses based on the literature review. The hypotheses are as follows:

- H1: Negative work situations positively affect sleep-related problems.
- H2: Work-family conflicts positively affect sleep-related problems.
- H3: Sleep-related problems positively affect job dissatisfaction.

This study merged two relationships to create a more robust model. Sleep-related problems were a dependent variable and an explanatory variable in the model. The relationship was verified by structural equation modeling (SEM). SEM has the advantage of estimating this kind of interdependence of several variables that reflect measurement errors.

Figure 1 shows the initial structural model. In Figure 1, ellipse means latent variable, and a rectangle is the measurement variable. *Di* is a disturbance or residual, and *ei* is measurement error.

In the structural equation model, negative work situation, which is a latent variable, is measured by 6 questionnaire items, work-family conflict by 5 questionnaire questions, sleep-related problems by 3 questionnaire questions, and job dissatisfaction by 6 questionnaire questions.

AMOS 18 and SPSS version 18.0 were used as analytical tools. The internal consistency of measured variables was performed by reliability analysis. Some measurement variables were eliminated by the standardized Cronbach's alpha. The convergent validity was confirmed through factor analysis. Path analysis was then performed to evaluate the proposed hypotheses.

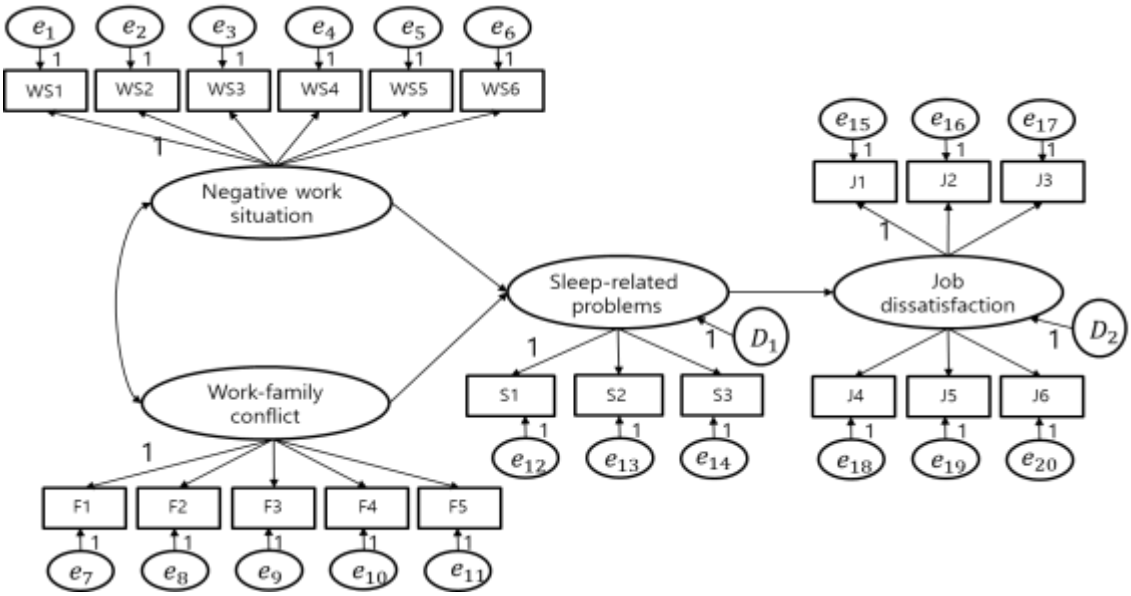

Figure 1. Conceptual model of this study. Rectangle represents measurement variable, and ellipse represents latent variable. *Di*: disturbance or residual; *ei*: measurement error.

3. Results

3.1. Reliability Analysis

Table 2 displays the final results of reliability analysis to ensure the internal consistency of the measurement variables. As shown in Table 2, two measurement variables in negative work situation and two measurement variables in job dissatisfaction were removed by Cronbach's alpha. The final result of reliability analysis yields a Cronbach's α value of 0.821, and it is very satisfactory.

Table 2. Results of reliability analysis using Cronbach's Alpha.

Latent Variable	Initial Measurement Variables	Final Measurement Variables	Standardized Cronbach's Alpha
Negative work situation	6	4	0.748
Work-family conflict	5	5	0.813
Sleep-related problems	3	3	0.821
Job dissatisfaction	6	4	0.800
	Instrument Total		0.821

3.2. Exploratory Factor Analysis

Factor analysis was useful for refining measures and evaluating construct validity.

In Bartlett's test and Kaiser-Meyer-Olkin (KMO) test results, Bartlett's test was significant ($p < 0.001$), and the KMO was above 0.60 (0.774). Factor analytical results, shown in Table 3, revealed that the factors could be classified into four dimensions: negative work situation, work-family conflict, sleep-related problems, and job dissatisfaction. From Tables 2 and 3, research variables and factors showed acceptable reliability and construct validity.

Table 3. Results of exploratory factor analysis and construct validity.

Factor	Measurement Variable	Component			
		1	**2**	**3**	**4**
Work-family conflict	F3: Family	0.811	−0.006	0.185	0.043
	F5: Responsibility	0.774	0.220	−0.038	0.035
	F4: Concentration	0.725	0.187	−0.006	0.036
	F2: Tired	0.709	0.001	0.107	0.193
	F1: Worry	0.680	0.134	−0.059	0.195
Job dissatisfaction	J2: Enthusiastic	0.234	0.772	0.085	0.126
	J3: Time	0.072	0.753	0.062	0.148
	J4: Work well	0.041	0.753	0.237	0.015
	J1: Energy	0.144	0.744	0.095	0.081
Negative work situation	WS1: Break	−0.067	−0.098	0.803	0.096
	WS2: Enough time	0.066	0.087	0.764	0.074
	WS3: Feeling well	0.107	0.323	0.715	0.105
	WS4: Ideas	0.070	0.324	0.632	−0.040
Sleep related problems	S1: Fall asleep	0.101	0.100	0.082	0.874
	S2: Waking up repeatedly	0.106	0.158	0.016	0.867
	S3: Exhaustion/fatigue	0.196	0.068	0.119	0.760
Instrument Total	% of Variance	18.213	16.570	14.300	14.022
	Cumulative (%)	63.105			
	Kaiser-Meyer-Olkin test	0.774			
	Bartlett's test	$p < 0.001$			

3.3. Structural Model Assessment

A chi-square test value usually determines the model fit, and other indices have been used for the assessment. The goodness of fit (GOF) was evaluated and compared with the suggested criteria shown in Table 4. The goodness of fit indices in Table 4 represented an acceptable fit of the model (χ^2 = 202.898, $p < 0.001$; NFI = 0.821; CFI = 0.897; GFI = 0.878; TLI = 0.874; RMSEA = 0.076).

Table 4. Results of model fit test.

Goodness of Fit Index	Good Fit	Acceptable Fit	Structural Model
χ^2			202.898
df			98
χ^2/df	< 2	2.0–5.0	2.070
p-value	< 0.001	0.050	< 0.001
NFI	> 0.90	0.85–0.90	0.821
CFI	> 0.90	0.85–0.90	0.897
GFI	> 0.90	0.85–0.90	0.878
TLI	> 0.90	0.85–0.90	0.874
RMSEA	< 0.06	0.06–0.08	0.076

3.4. Convergent Validity

The convergent validity was confirmed by average variance extracted (AVE) and composite reliability (CR). In Table 5, CR values were between 0.784 and 0.874 (acceptable criteria: > 0.70), so these results show strong composite reliability. The AVE values were also greater than correlations between variables, so the results supported convergent validity.

Table 5. Convergent validity and correlations with variables.

Hypothesis	Negative Work Situation	Work-Family Conflict	Sleep-Related Problems	Average Variance Extracted (AVE)	Composite Reliability
Negative work situation				0.478	0.784
Work-family conflict	0.217			0.468	0.814
Sleep-related problems	0.250	0.323		0.687	0.866
Job dissatisfaction	0.479	0.403	0.312	0.636	0.874

3.5. Nomological Validity

Figure 2 represents the direction of the correlation between latent variables. Figure 2 shows that the proposed relationships have the same directions, with relationships shown in Figure 2. The results supported the nomological validity.

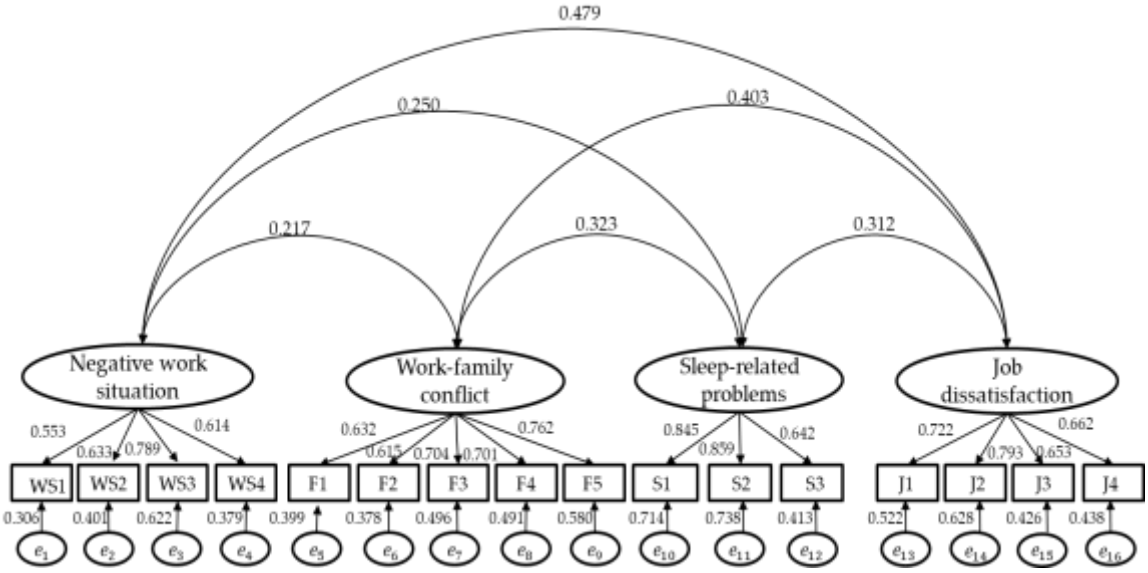

Figure 2. Result of confirmatory factor analysis. Rectangle represents measurement variable, and ellipse represents latent variable. *Di*: disturbance or residual; *ei*: measurement error.

3.6. Hypothesis Testing of the Structural Model

The structural model was evaluated to validate the hypothesized relationships. Table 6 represents the results of hypothesis testing for the proposed relationships among the constructs.

In Table 6, negative work situation and work-family conflict were found to have significantly positive effects on sleep-related problems. Thus, H1 and H2 were statistically validated. Similarly, sleep-related problems significantly influenced job satisfaction. H3, therefore, was statistically supported.

Table 6. Results of hypothesis testing for the proposed relationships.

Hypothesis	Paths	Standardized Coefficient (*r*)	Critical Ratio	*p*-Value	Result
H1	Negative work situation → Sleep-related problems	0.203	2.161	0.031	Supported
H2	Work-family conflict → Sleep-related problems	0.274	2.939	0.003	Supported
H3	Sleep-related problems → Job dissatisfaction	0.336	3.714	< 0.001	Supported

3.7. Effect of Work Situation and Work-Life Balance on Sleep-Related Problems and Job Satisfaction

As shown in Figure 3, negative work situations positively affected sleep-related problems (standardized path coefficient = 0.203). It can be interpreted that the higher the level of the negative work situation, the more significant influence on sleep-related problems. Among the measurement variables for a negative work situation, 'feeling well' (0.752) and 'enough time' (0.666) were found to be the influential variables.

The work-family conflict also had a significant impact on sleep-related problems (standardized path coefficient = 0.274). In other words, a higher work-family conflict level led to a higher level of sleep-related problems. Among the measurement variables for work-family conflict, 'family' (0.825) and 'tired' (0.721) were found to be the influential variables.

Also, sleep-related problems were more affected by the level of work-family conflict (0.274) than the negative work situation (0.203). Among the measurement variables for sleep-related problems, 'waking up repeatedly' (0.851) and 'difficulty fall asleep' (0.845) were the influential variables.

On the other hand, the sleep-related problems (standardized path coefficient = 0.336) affected job dissatisfaction. That is, a higher level of sleep-related problems led to a higher level of job dissatisfaction. Among the measurement variables for job satisfaction, 'enthusiastic' (0.792) and 'energy' (0.731) were the influential variables.

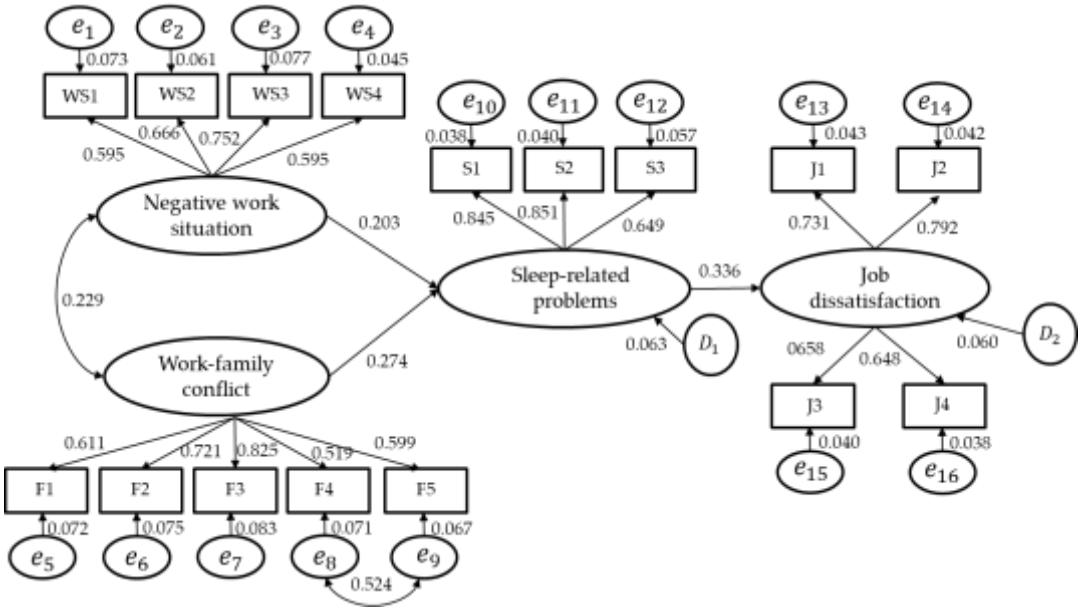

Figure 3. Final model of this study. Rectangle represents measurement variable, and ellipse represents latent variable. D_i: disturbance or residual; e_i: measurement error.

4. Discussion

Truck drivers are exposed to sleep-related problems and stress due to physical and mental fatigue [33]. Irregular shift schedules and extended driving hours are related to mental problems and adverse effects on health behaviors. Truck drivers are highly stressed by irregular working hours and shifts, leading to drowsy driving or dangerous driving situations. Truck drivers complain about not getting enough information and support for safety and health management. They work isolated from family and colleagues, so they often do not have access to health-related resources [34]. Furthermore, fatigue and sleep disturbances affect circadian rhythms and increase traffic crashes [25]. Therefore, driving schedule planning, work redesign, and health protection programs should be considered to prevent collisions [35].

Age-related declines in cognitive, perceptual, and motor capabilities negatively affect driving performance [36]. In South Korea, as the elderly population increases, the average age of truck

drivers is rising. In this study, the proportion of respondents aged ≥60 years accounted for 50.0% by reflecting the truck drivers' population ratio. Traffic crashes caused by elderly truck drivers are also increasing [1,5]. Thus, an active policy for elderly truck drivers is required. The driver-centered approach to the work environment and conditions can improve the work situation for safety and health [37,38]. Universal safety and design concepts can be an opportunity to enhance the working environment of older drivers and promote economic participation in society through policy and design considerations for seniors [39,40].

Limiting driving time can reduce work-family conflict and drowsiness [41]. Measures to ensure the effectiveness of hours-of-service regulation and institutional aspects regarding working hours and break times can improve working conditions. For truck drivers, how to monitor and implement a safe driving strategy is essential. U.S. truck drivers are required to have electronic onboard monitoring to adhere to hours of service regulations [42].

Workplace health and wellness program is being recognized as potentially enhancing employee health, satisfaction, and productivity. Researchers recommend psychological counseling as a way to improve a driver's sleep-related problem. Workplace health promotion programs also emphasize changes in health behavior [43]. Comprehensive efforts on working condition improvements and workplace health programs are recommended to yield better driver health outcomes [23,44] because comprehensive efforts could increase effectiveness and participation [37].

5. Conclusions

This research examined the interrelationships between negative work situation, work-family conflict, sleep-related problems, and job dissatisfaction. Based on the literature survey, this study tested three hypotheses on the interrelationships between negative work situation, work-family conflict, sleep-related issues, and job dissatisfaction. The results of this study suggested that negative work situation and work-family conflict significantly influence sleep-related problems in truck drivers. Also, truck drivers' sleep-related problems significantly affect their job dissatisfaction. The results of this study can be used to establish preventive policies for truck drivers' safety and health.

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