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Abstract: This study is undertaken to explore the sources of stress which enhance the accident risk of AHV drivers and try to develop corresponding strategies to improve the driving safety for AHV drivers. In this paper, we introduce the relationship between work pressure and accident risk and develop a conceptual model based on this relationship. An empirical study was conducted by using the data collected from a face to face interview with AHV drivers to verify our hypothetical relationship. The findings of this study provide a set of valuable information to help setting effective policies and strategies.

Keyword: Aggregate hauling vehicle (AHV), Working environment, Working stresses, Accident risk

# 1. INTRODUCTION

Construction aggregate (such as sand, gravel, stone etc.) transportation occupies a significant proportion of freight transportation market for trucking industry in Taiwan. There are more than twenty thousand aggregate hauling vehicles (AHV) in operation and a significant proportion of the AHV drivers are independent operators. Under severe freight fare competition, overloading and speeding become the common operation behaviors for AHV drivers. An study of reviewing truck accident risk showed (Chang *et al.*, 1999) the AHV experienced the traffic accident rate of 12.2 deaths per hundred million traveling kilometers, which is much higher than the accident rate of 6.39 deaths per hundred million traveling kilometers for large trucks in all.

Due to the weight and speeding, the AHV-involved accidents usually result more severe injuries than the other traffic accidents. Under the pressure from the public's argument against AHV's high operation risk, the Department of Transportation is eager to explore the factors affecting the accident risk of AHV and find some effective strategies to improve the operation safety for AHVs.

Related studies (Chang *et al.*,1999; Chang and Wu,1999) indicated the unhealthy organization structure of trucking industry and poor working environment for AHV drivers are the two most important factors causing high accident risk of AHVs. The former includes the small scale of trucking company, illegal operators, poor vehicle maintenance, lack of safety management, and inefficient administration management. And the latter includes the physical pressure (such as fatigue and sleep deprivation) and psychological pressure (such as roadway traffic condition during on work, worry about involving an accident or getting traffic violation tickets) which come from AHV drivers' working condition and environment.

This study is undertaken to explore the sources of stress which enhance the accident risk of AHV drivers and try to develop corresponding strategies to improve the driving safety for AHV drivers. In this paper, we introduce the relationship between work pressure and accident risk and develop a conceptual model based on this relationship. An empirical study was conducted by using the data collected from a face to face interview with AHV drivers to verify our hypothetical relationship. The findings of this study provide a set of valuable information to help setting effective policies and strategies.

# 2. THE CONCEPTUAL MODEL FOR THE RELATIONSHIP BETWEEN WORKING PRESSURE AND ACCIDENT RISK FOR AHV DRIVERS

Appropriate pressure makes people to do things better, brings achievement to people, and helps people to feel satisfied. However, if the loading of pressure is more than one can bear, it not only makes him do things worse, but also brings the unhealthy psychological and physical impacts to that person. Bus drivers are thought of the people who bear the most work pressure among the roadway transportation professionals(Evans & Carrer,1991 ; Long & Perry,1985 ; Winkeby,1988 ; Jen & Huang 1994;Hsu,1997 ) AHV drivers have the similar working conditions and environments to bus drivers, and presumably should have heavy work pressure too. Those heavy working pressures are thought to directly or indirectly bring high potential accident risk to AHV drivers. And it is interesting and valuable to know where the working pressures come from.

The relationship between stress and health has been discussed and verified for a long time in the field of occupational therapy (Jex, 1998). Theoretically, the stressor brings pressure to people. If this pressure is not appropriately mediated or moderated, it will hurt the health and bring the illness to people (see Figure-1). Based on the concept, if the work pressures on AHV drivers really exist and are not appropriately released, they will bring physical or psychological illness and result the higher traffic accident risk to the drivers.



Figure-1: The paradigm of Stress models (Source: Lu, 1994)

## 3. THE SOURCES OF STRESS TO AHV DRIVERS

Based on the literature about occupational pressures (Evans & Carrer,1991 ; Long & Perry,1985 ; Winkeby,1988 ; Jen & Huang 1994;Hsu,1997), some hypothetical stressors for AHV drivers are derived in this study. Those stressors are classified as following categories:

(1) <u>Stresses from workload</u>: The length of work hours and amount of tasks are the most representative indices for workload. The longer the drivers work, the heavier the work pressure the drivers will be confronted with. Most independent operator drivers have extra work besides driving, such as connecting customers, arranging vehicle maintenance, and

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searching for business, which might bring more stresses to the AHV drivers. Furthermore, if the drivers do not have adequate break time for rest during work, it might bring pressure and result higher accident risk to them.

- (2) <u>Stresses from working environment</u>: The working environment brings various levels of pressures to the drivers. The poor working environment will bring much more pressure to drivers than the pleasant environment. Heavy traffic might make drivers nervous and traffic congestion might defer the time to finish drivers' missions, which both bring pressure to AHV drivers. Besides, conditions of the cabin and rest area will also influence the mood of working and bring different levels of pressure to the AHV drivers.
- (3) <u>Stresses from the organization of trucking industry</u>: The organization of trucking industry provides a competing market for AHV drivers. Facing the competition of illegal operators and uneconomic scale of trucking company, the AHV drivers are forced to work longer and take risky driving (such as speeding, violating weight regulation, and neglecting the necessary maintenance for vehicles). It brings a lot of working pressure to the AHV drivers.
- (4) <u>Stresses from family</u>: Irregular work hours make the AHV drivers unable to keep close contact with their family members. It might make the AHV drivers have less opportunity to release their pressure from working.
- (5) <u>Stresses from job security</u>: The achievement of work makes the professional drivers self-satisfied and encourages drivers to work hard. On the contrary, less achievement of work and the threat of job security will make the professional drivers depressed and bring a lot of pressure during work.
- (6) <u>Stresses from achievement and wage</u>: Reasonable pay and good compensation are the required conditions to keep the professional drivers staying in their positions. Otherwise, the professional drivers will not dedicate themselves to their jobs, and will prevent themselves from doing jobs well.

According to the paradigm of stress model and the sources of stress, a conceptual framework for the effect of work pressure on the traffic accident risk for AHV drivers are then developed as shown in Figure-2. In response to the work pressures from various stressors, the AHV drivers might feel tired, get nervous, and intend to quit. Those responses might finally bring fatigue to the drivers and result high accident risk for AHV drivers (Matthews *et al.*,1998). Furthermore, the AHV drivers might have some dangerous driving behaviors in response to the pressures from stressors, such as speeding, violating weight-loading and work hour regulation. According to previous studies (Chang *et al.*,1999), half of the AHV drivers work more than twelve hours per day and most of them have much experience of having a doze front the wheels.

# 4. DATA COLLECTION THROUGH FACE-TO-FACE INTERVIEWS WITH AHV DRIVERS

In order to verify the hypothetical structure, we make a set of questions to ask AHV drivers whether they agree our statements. Those questions are generated based on the possible sources of stressors introduced in previous section (see Table-1). Questionnaires are designed by a scale of 5 levels and the AHV drivers are asked to write down a number between 1 and 5 according to the degree of their agreements to the statements. The numbers 5,4,3,2,1,

represent "strongly agree", "agree", "no comment", "disagree", and "strongly disagree" with the statement respectively.



Figure-2: The conceptual framework for the effect of work pressure on accident risk.

One hundred and ninety seven AHV drivers, including one hundred and seventeen company hired drivers and eighty independent operator drivers, around the island were interviewed in the winter of 1999. All of interviewed AHV drivers are males. The average age of interviewed AHV drivers is about forty years old. Forty four percent of interviewed AHV drivers are between forty and forty-nine years old, thirty six percent drivers are between thirty and thirty-nine years old. One hundred and seventy two AHV drivers are married, twenty-one drivers are single, and six drivers have divorced among the singles.

Three kinds of information were collected through those interviews. The interviewed AHV drivers were first asked to present their agreements to the 17 questions that were designed to determine where the pressures come from. The AHV drivers were also asked to answer their responses to those working stressors and experiences of being involved into an accident.

The statements of "I usually feel tired during work", "I usually feel nervous during work", and "I usually think to quit my job" are designed to determine whether the working stressors have brought the pressures to the drivers. The interviewed drivers are asked to show their opinions to those statements in terms of "strongly agree", "agree", "no comment", "disagree", and "strongly disagree". Finally, the AHV drivers are asked whether they have the experience of being involved in traffic accidents. Among 129 drivers who answer this question, only 13 AHV drivers have the record of involving an injury or fatal traffic accident during the past one year.

# 5. WORK STRESS PERCEPTION ANALYSIS FOR AHV DRIVERS

The mean and variance of perception scores about the work pressures are listed in Table-2. Traffic congestion during work has the highest average perception score for work pressure (3.95), and is commonly recognized as the most important stressor to bring pressure to AHV

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drivers. Worrying about getting fined (3.88), escaping from the interruption of captious policemen (3.84), worrying about involving an accident (3.82), and being afraid of losing their jobs (3.74) are also significant factors to bring pressures to AHV drivers. Among these five important stressors, four stressors belong to the category of working environment, and one comes from the category of job security.

Sources of working stresses	Contents and measurements
<u>Category A:</u> Stresses from workload	<ol> <li>I feel my working hours too long.</li> <li>I feel the travel time for one trip is long.</li> <li>I feel I do not have enough break time during work.</li> </ol>
<u>Category B:</u> Stresses from working environment	<ol> <li>I suffer from the roadway congestion during on duty.</li> <li>I feel the locations and facilities of rest areas are not good enough for rest.</li> <li>I am worried about getting fined.</li> <li>I am worried about involving a traffic accident</li> <li>I am bothered by the interruption from captious policemen.</li> </ol>
<u>Category C:</u> Stresses from the organization structure of trucking industry	<ol> <li>I feel my company's administration policies unfair and unreasonable.</li> <li>I feel my company does not care about our needs.</li> <li>I feel my company does not have good fringe benefits.</li> <li>I feel the employee union does not fight for our benefits.</li> </ol>
<u>Category D:</u> Stresses from family	<ol> <li>My job makes me unable to keep close contact with my family members.</li> <li>I feel my family members do not support my job.</li> </ol>
<u>Category E:</u> Stresses from job security	1.I am afraid of losing my job.
Category F: Stresses from achievement and wage	<ol> <li>I am not satisfied with my wage.</li> <li>I feel my wage is lower than people with the same age or education levels as I am.</li> </ol>

Table-1: Sources of working	g stress and their measurements
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Most AHV drivers are not satisfied with their wage (3.66) and feel the employee union does not fight for their benefits (3.62). AHV drivers commonly feel they work too long (3.57), they do not have enough break time during work (3.49), and they do not have good places and facilities for rest (3.25). Among the second five important stressors, three come from the categories of working environment, organization structure of trucking industry, and wage respectively, and the other two come from the category of workload.

The stressors coming from family (perception scores are 2.68 and 2.31 respectively) are not so significant as expected. This might be the case that almost half of the interviewed AHV drivers are independent operator drivers. The independent operator drivers do their business independently and have more freedom to arrange their work schedules than the company-hired drivers. Furthermore, the independent operator drivers are both employee and bosses. They do not have pressures coming from company's administration policies and fringe benefits. The study result for stress perception also indicates that the AHV drivers care

more about their wages than their work achievement.

Sources of stress	Category of Stressor	Mean	Standard Error
<ol> <li>I suffer from roadway congestion during on duty.</li> </ol>	В	3.9534	1.2677
2.I am worried about getting fined.	В	3.8756	1.4161
3.I am bothered by the interruption from captious policemen.	В	3.8359	1.2898
<ol> <li>I am worried about involving a traffic accident</li> </ol>	В	3.8187	1.3969
5. I am afraid of losing my job.	E	3.7409	1.2810
6. I am not satisfied with my wage.	F	3.6561	1.2087
<ol><li>I feel the Union does not fight for our benefits.</li></ol>	С	3.6243	1.3806
8. I feel my working hours too long.	A	3.5670	1.2869
<ol> <li>I feel I do not have enough break time during work.</li> </ol>	А	3.4922	1.2167
10. I feel the locations and facilities of rest areas are not good enough for rest.	В	3.2527	1.2415
11.I feel my company does not have good fringe benefits.	С	3.1579	1.2792
12.I feel my wage is lower than people with the same age or education levels as I am.	F	3.0154	0.9869
13. I feel the travel time for one trip is long.	A	2.9641	1.1770
14.I feel my company's administration policies unfair and unreasonable	С	2.9415	1,2966
15. My job makes me unable to keep close contact with my family members	D	2.6788	1.3883
<ol> <li>16.I feel my company does not care about our needs.</li> </ol>	С	2.5288	1.2599
<ol> <li>I feel my family member do not support my job.</li> </ol>	D	2.3085	1.2412

Table-2: Stress perception scores of AHV drivers

In summary, the AHV drivers commonly perceive the existence of stressors that come from workload, working environments, job security, and wage.

The correlation analysis between AHV drivers' attributes and stressor perception was conducted to explore the relationship between the AHV driver's attributes( age, marriage status and no. of kids) and stressor perception. The coefficients of correlation between the AHV driver's attributes and stressor perception are shown in Table-3.

There are 4 stressors show their significant correlation with at least one driver's attribute among 17 stressors. Long hours of working is significantly correlated with the driver's no. of kids at the level of  $\alpha = 0.05$ . The drivers with no kids or few kids feel more pressure than the drivers with more kids from "long hours of working". The stressor perception from "the poor locations and facilities of rest areas" is significantly correlated with the driver's marriage status at the level of  $\alpha = 0.05$ . The single drivers feel more pressure than the married drivers The Relationship Between the Working Pressure and Accident Risks for Aggregate-Hauling Vehicle

from the poor locations and facilities of rest areas.

Stressor perception	Driver's age	Marriage status	No. of kids
1.I feel my working hours too long.	008(.918)	.035(.636)	160**(.041)
2.I feel the travel time for one trip is long.	113(.138)	.000(.995)	040(.616)
3.I feel I do not have enough break time during work.	114(.137)	054(.461)	151(.056)
4.I suffer from the roadway congestion during on duty.	019(.802)	004(.953)	.053(.505)
5.I feel the locations and facilities of rest areas are not good enough for rest.	106(.176)	.170**(.022)	.018(.822)
6.I am worried about getting fined.	036(.642)	002(.983)	067(.397)
7.I am worried about involving a traffic accident	.011(.888)	.045(.539)	043(.587)
8.I feel my company's administration policies unfair and unreasonable.	179**(.021)	.194**(.008)	101(.207)
9. I feel my company does not care about our needs.	034(.661)	.257**(.000)	028(.727)
10.I feel my company does not have good fringe benefits.	127(.103)	006(.934)	.001(.992)
11.My job makes me unable to keep close contact with my family members.	.101(.189)	025(.734)	.023(.776)
12.I feel my family members do not support my job.	.024(.759)	113(.126)	.000(.997)
13.I am bothered by the interruption from captious policemen.	061(.430)	020(.781)	.050(.529)
14.I feel the employee union does not fight for our benefits.	.013(.869)	057(.438)	.088(.269)
15.I am afraid of losing my job.	024(.752)	055(.451)	080(.309)
16.I am not satisfied with my wage.	.008(.919)	.021(.771)	028(.727)
17.I feel my wage is lower than people with the same age or education levels as I am.	.033(.667)	.114(.117)	.028(.722)

Table-3. The coefficients of correlation between the AHV driver's attributes and stressor perception. (The numbers in parentheses are p-values).

\* Correlation is significant at the 0.1 level.\*\* Correlation is significant at the 0.05 level.

The stressor perception from "the unfair or unreasonable company's administration policies" is significantly correlated with the driver's age and marriage status at the level of  $\alpha = 0.05$ . The younger and single drivers feel more pressure from the unfair or unreasonable company's administration policies. Lacking concern of company is also significantly correlated with the driver's marriage status at the level of  $\alpha = 0.05$ . The single drivers feel more pressure from the stressor.

The other stressors are not significantly correlated with the driver's attributes. The result of this correlation analysis shows the younger, single drivers might feel more pressure from the stressors discussed above.

We now try to move a further step to know whether those stressors really bring pressures to AHV drivers. The study results about the perception scores of responding pressures to stressors are listed in Table-4. Among the three symptoms responding to pressures, AHV

drivers have the highest perception score (3.54) to think to quit the job. It apparently shows that AHV drivers tend to choose quitting their job to release their working pressures.

The average perception scores for feeling tired and feeling nervous during work are 2.92 and 2.71 respectively. They are both below the value of 3.0 that is the threshold to differentiate "agree" from "disagree". It means the AHV drivers do not commonly perceive the stressors make them tired and nervous during work.

Response to Stressors	Mean	Standard Error
1.I usually feel tired during work.	2.9236	1.0583
2.I usually feel nervous during work.	2.7143	1.1647
3.I usually think to quit my job.	3.5357	1.1531

Table-4: Perception scores for the responses to stressors.

Though the AHV drivers do not significantly perceive tired and nervous during work in all, we wonder it might be the case resulted from high perception variation among individual drivers. In order to have an insight into the perception ratings of individual drivers, a correlation analysis between stressor perception and responding pressure perception was conducted. The coefficients of correlation between the stressor perception and responding pressure perception are shown in Table-5.

Among the 17 hypothetical stressors discussed in previous section, there are 12 stressors show their significant correlation with at least one corresponding pressure and their coefficients of correlation are positive as expected. It means the increasing of stressor perception will result the increasing of responding pressure. Long time of driving, long hours of working, worrying to involve an accident, and dissatisfying the wage are significantly correlated with all the three responding pressures at the level of  $\alpha = 0.05$ . They are the four most important stressors that make AHV drivers to produce responding pressures.

Roadway traffic congestion and dissatisfying career achievement and wage significantly bring the pressures of feeling nervous at work and intention to quit the job to AHV drivers. Lacking concern of company significantly makes AHV drivers feel tired on work and intend to quit their jobs.

Some stressors only significantly bring one responding pressure to AHV drivers. Worrying about getting fined, lacking the help from employee union, not having enough break time for rest, and not having fringe benefits from company significantly make the AHV drivers nervous on work. However, worrying about the job security significantly makes the AHV driver feel tied during work.

So far we have explored the stressor perception for AHV drivers and tested the correlation between stressor perception and responding pressure perception. However, we still lack the relationship between working pressure and accident risk to connect the stressors with accident risk. Though we have the accident record for each AHV driver, we still have the difficulty to connect the relationship between pressure perception and accident risk. It is hard to distinguish whether the pressure results the occurrence of accident or the occurrence of accident results higher pressure to AHV drivers. Nevertheless, the study results from a binary logit model, which divides the drivers into "with" and "without" accident record groups, showed the more the drivers feel tired during work, the more likelihood the AHV drivers will

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be involved in traffic accidents.

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Responding pressure perception	Feel tired during work	Feel nervous during work	Intend to quit			
Stressor perception	0	Ū	-			
<ol> <li>I am really bothered by roadway congestion on duty.</li> </ol>	0.75 (0.376)	0.255** (0.008)	0.167* (0.050)			
2.I am worried about getting traffic violation tickets.	0.055 (0.512)	0.247** (0.003)	0.043 (0.620)			
3. I feel upset to the intentional interruption from captious policemen.	0.110 (0.190)	0.159 (0.061)	0.140 (0.100)			
4. I am worried about involving a traffic accident.	0.226** (0.007)	0.226** 0.273** (0.007) (0.001)				
5. I am really worried about my job security.	0.178* (0.034)	0.178* 0.110 (0.034) (0.197)				
6. I feel my salary is too low.	0.221** (0.009)	0.180* (0.036)	0.233** (0.007)			
7. I feel the Union does not fight for our benefits.	0.086 (0.320)	0.086 0.293** (0.320) (0.001)				
8. I feel my daily working hours is too long.	0.260** (0.002)	0.174* (0.040)	0.323** (0.000)			
9. I feel the break time during on duty is too short.	0.126 (0.137)	0.225** (0.008)	0.096 (0.263)			
10. I feel the locations and facilities of rest areas are poor for rest.	-0.076 (0.380)	0.077 (0.377)	-0.098 (0.262)			
<ol> <li>I feel my company does not have good fringe benefits.</li> </ol>	-0.008 (0.930)	0.204* (0.016)	-0.027 (0.754)			
12. I feel my wage is lower than people with the same age or education levels.	-0.059 (0.486)	0.216* (0.011)	0.208* (0.014)			
13. I feel the travel time for one trip is long.	0.217** (0.009)	0.171* (0.043)	0.218** (0.010)			
<ol> <li>I feel my company's administration policies unfair and unreasonable.</li> </ol>	0.104 (0.224)	0.062 (0.470)	0.153 (0.076)			
15. I feel my job will affect my relationship with my family members.	0.158 (0.061)	-0.006 (0.949)	(0.606)			
16. I feel my company does not care about our needs.	0.181* (0.033)	0.089 (0.301)	0.180* (0.036)			
17. I feel my family does not support my job.	0.064 (0.455)	0.103 (0.237)	0.124 (0.153)			

Table-5: The coefficients of correlation between the responding pressure perception and stressor perception. (The numbers in parentheses are p-values)

\*\* Significant at the level of  $\alpha = 0.01$ . \* Significant at the level of  $\alpha = 0.05$ .

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#### 6. PEOPLE WHO ARE ABLE TO HELP AHV DRIVERS

Facing the tough market competition, the AHV drivers all recognize to bear much working pressure in order to survive. Many of them even take risky operation strategies for sake of making more money and some dangerous driving behaviors have appeared on the highway AHV transportation for a long time. A lot of effort has been spent on searching the strategies to cut down the high accident risk of AHV transportation. However, there is little effort trying to reduce the accident risk through releasing the working pressure of AHV drivers. We have explored where the pressures come from and connected those pressures to accident risk. Now, we have the another question about how we can help the AHV drivers to release their pressures on work and how we can correct their dangerous driving behavior in response to heavy pressure.

In order to select the right persons to help AHV drivers release their tight pressures and instruct them to take the right actions in response to the pressure, we conducted a survey to realize who are the persons trusted by AHV drivers and able to help AHV drivers. The AHV drivers are asked to rate the persons who are thought to be helpful in releasing pressures and correcting the dangerous behaviors for them. The rating is scaled to 9 levels which are designated by the scores of 0,1,2,...7,8. The more the score is, the more appropriate the persons will be. The rating scores for the people who are able to help AHV drivers are listed in Table-6. It is of no surprise that the family, friends, company owners, and peer drivers are thought by AHV drivers to be the most influential people to help them release pressure and correct dangerous driving behaviors. It is interesting to find that the traffic safety experts or professionals and officers are not rated as the high rank as we expected.

Types of People	Mean	Standard Error		
The family	6.9793	1.6550		
Friends	6.3089	1.7574		
Company owners	6.1376	1.8629		
Peer drivers	6.0576	1.7020		
Relatives of accident victims	5.5838	2.3556		
Social public	5.3158	2.4005		
Police	5.2518	2.6358		
The other road users	5.1862	2.3724		
Sandstone demanders	5.0899	1.9671		
Traffic safety experts or professionals	4.9679	2.2693		
Staff of the sandpit	4.9524	1.7962		
Officers	4.8118	2.3463		

Table-6:	Perception	scores to	the	people	who	are	thought	to	be	helpful	to	influence
	AHV drive	ers' behav	or.									

#### 7. CONCLUSIONS AND SUGGESTIONS

We started this study with developing a conceptual framework for the effect of work pressure on the traffic accident risk for aggregate hauling vehicle drivers. Then a series of surveys were conducted to collect the required data to verify the relationship among stressors, responding pressures, and accident risk. After a series of surveys and analyses, some conclusions of this study are summarized as followed: The Relationship Between the Working Pressure and Accident Risks for Aggregate-Hauling Vehicle Drivers in Taiwan

- The sources of working stresses for AHV drivers are classified into six categories. They are stresses from workload, working environment, organization of trucking industry, family, job security, and achievement and wage.
- (2) The major working stressors for AHV drivers come working environment, workload, job security, and wage (or income). The stressors coming from family and organization of trucking industry are not so significant as expected. This might be the case that almost half of the interviewed AHV drivers are independent operator drivers.
- (3) The study result for stress perception indicates the AHV drivers care more about their wages than their work achievement.
- (4) Among the three symptoms responding to pressures, AHV drivers have the highest perception score for thinking to quit the job. It apparently shows that AHV drivers tend to choose quitting their job to release their working pressures. The AHV drivers do not commonly perceive the stressors make them tired and nervous during work.
- (5) Long time of driving, long hours of working, worrying to involve an accident, and dissatisfying the wage are significantly correlated with all the three responding pressures at the level of  $\alpha = 0.05$ . They are the four most important stressors that make AHV drivers to produce responding pressures.
- (6) The study results from a binary logit model, which divides the drivers into with and without accident record groups, showed the more the drivers feel tired during work, the more likelihood the AHV drivers will be involved in traffic accidents
- (7) The family, friends, company owners, and peer drivers are thought by AHV drivers to be the most influential people to help them release pressure and correct dangerous driving behaviors. The traffic safety experts or professionals and officers are not rated as the high rank as we expected.

Based on the findings from previous analyses, some suggestions are raised and summarized as followed:

- (1) The work pressures of AHV drivers are mainly resulted from the competing market and the existence of independent operator drivers. It is suggested to establish the policy to encourage the large size of trucking company.
- (2) Some information techniques should be adapted to help the AHV drivers escape from the roadway congestion and release their working pressure.
- (3) On-job trainings are suggested to help AHV drivers understand working pressures and learn how to get over work pressures for themselves.
- (4) Work hour regulation is helpful to release the pressure resulted from prolonged driving. It is suggested to force the AHV drivers to record daily log.

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