Driving Anger in China: A Case Study on Professional Drivers

Zhongxiang Feng[a,*], Yewei Lei[a], Hongchao, Liu[b], Weihua Zhang[a], Kun Wang[a], Shisheng Lu[a]

[a]School of Transportation Engineering, Hefei University of Technology, Hefei 230009, Anhui, PR China;

[b]Department of Civil and Environmental Engineering, Texas Tech University, Box 41023, Lubbock, TX 79409, United States

Abstract:

This paper investigated the types of situations that caused drivers to become angry while driving in China by using the professional driver's group as a case. The revised Chinese version of 19-item DAS was used to examine driving anger amongst a sample of 132 professional drivers. The resultant data were presented by principal components analysis, reliability and validity test, producing four categories of anger provoking situations: discourtesy, traffic obstructions, illegal driving and slow driving. Compared with the studies conducted in other countries, overall levels of driver anger were lower than that found in the USA and Malaysia. As to the demographics and descriptive variables, it was found that age, driving experience, and mileage were weakly correlated to driving anger. Preferred speed was positively related to driving anger. In addition, there also existed personality difference in driving anger, with the drivers of type A personality and middle personality reporting higher levels anger than those type B personality. In face to certain traffic scenarios, drivers in the anger-out and the anger-in groups were found to have higher anger scores than those in the anger-control group. As for professional drivers, preferred speed and types of personality about anger expression became important variables to predict anger. Through the dedicated survey and comprehensive data analyses, this study intends to provide valuable inputs to the development of Chinese version of DAS for accurately measuring the driving anger of Chinese professional drivers.

Keywords: Risky driving; Driving anger; DAS; Road rage; Professional drivers; China

1. Introduction

Road rage refers to the emotion of anger caused by the pressure and frustration arising from driving. Arnold and Plutchik (1964) believe that anger is a kind of hostile emotion, whose intensity develops from weak to strong. Anger cannot only work on others, but also on oneself. For anger expression, there are two ways – internal and external, which not only interferes with people's attention, and even affects people's abilities of risk perception and information processing, but also has a negative influence on other road users (Funkenstein King & Drolette, 1954). Previous studies found that anger was closely related to drivers' aggressive and risky behaviors while driving, such as speeding, honking loudly, overtaking and threatening verbally etc., which might lead to traffic accidents (Deffenbacher, Lynch, Oetting & Yingling, 2001; Deffenbacher, 2003). Study shows the number of traffic accidents related to road rage may account for 3% to 8% of the total accidents (NHTSA, 2007). What's more, in daily life to experience anger for drivers while driving is much more common. For example, a diary approach to study driving anger shown that 85% of the 100 drivers studied over a period of 2 weeks to experience anger while driving (Underwood, Chapman, Wright & Crundall, 1999). According to a survey conducted in 2008, more than 60% of the drivers in China had the experience of driving with the emotion of anger (Sohu, 2008). As a whole, road rage, as a typical negative emotion while driving has become a

common fault all over the world.

Studies on road rage have been primarily focused on the development and application of Driving Anger Scales (DAS). Because a driver's emotion is largely affected by the environment he is experiencing, DAS as a self-reported questionnaire is used to evaluate the levels of drivers' anger in different traffic scenarios. Drivers are asked to imagine the levels of being enraged in different traffic scenarios and their responses are presented through self-reports. The original DAS was developed in the United States by Deffenbacher, Oetting and Lynch (1994), and it was shown in two forms, long and short. The short scale contained only one factor with 14 items; while the long scale contained six factors (police presence, illegal driving, slow driving, traffic obstructions, hostile gestures and discourtesy) with 33 items.In support of the original 33-item DAS, some researches were carried out to explore driving anger in different countries (Deffenbacher et al., 1994; Deffenbacher, Lynch, Oetting & Swaim, 2002; Deffenbacher, Deffenbacher, Lynch & Richards, 2003; Nesbit, Conger & Conger, 2007;Yasak & Esiyok, 2009). However, there is variation in the underlying structure of the scale. The original six factor structure has been changed through principal components analysis (PCA) in the UK because a number of the original items did not evoke anger amongst native drivers. Thus, researchers adopted a 21-item version of DAS including three factors, which were labeled: "impeded progress", "reckless driving" and "direct hostility" (Lajunen, Parker & Stradling, 1998). O'Brien, Tay and Watson (2002) showed the findings suggest that the DAS items might lack the situational or contextual cues. In France, researchers used a 22-item version of DAS and found a five-factor model (impeded progress, illegal driving, hostile gestures, police presence and traffic obstructions) best fitted their data (Villieux & Delhomme, 2007). The dissimilar findings made in these researches raised some doubts as to whether all the original 33 situations or factor structure of the DAS would provoke anger among Chinese drivers. Compared to the European countries and the United States, studies on driving anger and the resulted safety problems were neither timely nor sufficient in China. Recently, the original DAS was used to investigate the differences in the levels of driving anger between Chinese and German drivers. It was found that Chinese drivers' perception of driving anger was quite different from the original 6-factor model, while the German drivers' was similar to what the model presented (Liu, Zhou & Oeh, 2013). The inconsistencies in factor structure and representative items of DAS in different countries might in part be explained by factors such as culture, driving experience, driver group, traffic characteristics, even dissimilar analytical methods (Lajunen et al., 1998; Liu et al. 2013; O'Brien et al., 2002; Villieux & Delhomme, 2007).

Detailed investigations on driving anger scale were further conducted by a handful of researchers. There is relative agreement in some literatures about the relationship between driving anger and a number of demographic variables such as drivers' age, gender, driving experience, mileage, etc. For example, some results showed that the probability of getting enraged in the young drivers' group was much higher than that in the older drivers' group, and experienced drivers were apparently lower anger than novice drivers (Björklund, 2008; Maxwell, Grant & Lipkin, 2005; Parker, Lajunen & Summala, 2002). By using DAS as a measurement tool, the relationship between road rage and driving behaviors was investigated. It was found that the drivers who reported to have experienced higher levels of

anger also had more aggressive driving behaviors (Lajunen et al., 1998). Even, demographic information and driving behaviors were shown interaction on driving anger. Some studies found that gender and speeding are also non-negligible factors of anger propensity (Sullman, 2006; Sullman, Gras, Cunill, Planes & Font-Mayolas, 2007).Thus, when investigating driving anger, demographic variables and driving behaviors are necessary.

Some researchers associated crash involvement with personalities because there existed relationships between personality traits and driving behaviors (Benfield, Szlemko & Bell, 2007; Elander, West & French, 1993). In the study of relationship between personality and driving behavior, Type A behavior pattern has been highly concerned.Type A behavior pattern was first discovered in patients with coronary heart disease by cardiologists, Friedman and Rosenma (1959), and its typical behavioral characteristics were described as intense ambition, aggressiveness, competitive "drive", constant preoccupation with occupational "deadlines", and a sense of time urgency. A relative absence of these characteristics was defined the converse Type B behavior pattern). After that, a 14-item Type A scale as a valid measurement tool, using a semantic differential-type procedure, was designed by Bortner (1969). Initially, the sacle was mainly used to do research on causal relevance to coronary heart disease. However, Perry (1986) attempted to link the behaviors of the type A people with their driving behaviors and found that they tended to be more impatient, involved in more accidents, and received more tickets. Evans, Palsane and Carrere (1987) found that in the United States, Type A bus drivers had more accidents and self-reports of occupational stress than Type B bus drivers. In India, but not in the United States, Type A drivers brake, pass, and blow their horns more often than Type B drivers. Some studies found that Type A drivers were involved in much more accidents and more aggressive on the road（Magnavita, Narda, Sani, Carbone, Lorenzo & Sacco, 1997；Perry & Da, 2000). In China, bus drivers who had type A personality were found more errors and violations while driving than those of non-type A groups (Sun, 2009). Type A personality is a typical aggressive personality threatening traffic safty, so it is vital to explore this personality's effects on driving anger.

Driving anger has been defined as a situation specific form of trait anger (Deffenbacher et al., 1994).There were some evidences to suggest that driving anger is related to with state-trait anger theory and significant positive relationship was found between state anger, trait anger and driving anger (Deffenbacher, Lynch, Oetting & Yingling, 2001; Deffenbacher, Richards, Filetti & Lynch, 2005; Sullman, Stephens & Yong 2014). However, there is no research exploring the levels of dirving anger among people who had different anger expression ways. Through State-Trait Anger Expression Inventory-2, people will be divided into three types in anger expression, namely anger-out, anger-in and anger control group (Spielberger, 1999). Anger-out is characterized by venting anger to others, while anger-in refers to hidden anger in their mind, and anger control group in between. In some studies, researchers found that the anger-out and anger-in groups act differently in the face of difficulties and setbacks (Funkenstein, King & Drolette, 1954; Tao, 2009; Zhang, Tao, Qiao & Zhang, 2011). To investigating if peple who have different anger expression ways are induced different levels of anger on road, it may be interesting for the study.

In general, non-professional drivers instead of professional drivers were selected as the

sample to investigate which traffic scenarios would induce driving anger for them. As special groups, professional drivers who work as drivers in transport companies such as bus divers, taxi drivers and so no. Due to high road traffic exposure, it was reported that professional drivers contributed significantly to road traffic accident statistics, and they had a higher accident risk than other drivers (Broughton, Baughan, Pearce, Smith & Buckle, 2003). Generally, professional drivers carried out most of their driving in relation to tight time schedules and this might impact their risk levels (Dorn, Stephen, af Wåhlberg & Gandolfi, 2010).In the aspect of driving anger and aggressive driving, a research found minibus drivers were more aggressive in traffic compared to non-professional drivers (Öz, Özkan & Lajunen, 2010). So far, few researchers pay attention to driving anger among professional drivers. Thus, the present study selected a type of professional drivers, namely bus drivers as sample to explore their anger emotion on road. It will be helpful to conduct group intervention in driving anger of bus drivers on the basis of research conlusions.What's more, this study are to provide some evidences to the selection and training of professional drivers.

The present study investigated driving anger in a sample of professional drivers from China. And this research aimed to revise the DAS and verify its reliability and validity; identify which typical traffic scenarios are rated as the most anger provoking by professional drivers in China; explore the differences among the drivers of type A personality, middle personality and type B personality in driving anger; investigate the difference, if any, among three types of personality about anger expression, namely anger-out, anger-in and anger control-group in driving anger. Furthermore, the data were tested for examining the relationships between driving anger with demographics such as age, driving experience, mileage and descriptive variables. Finally, in present study, the factor could predict driving anger was investigated among professional drivers.

2. Method

2.1 Materials

Driving Anger Scale: All items on each subscale in the original 33-item driving anger scale were translated into Chinese language following the translation/back-translation procedure by a professional translator who was proficient at English–Chinese translation. Then, collective discussions of the Chinese version DAS were conducted among an extended group of researchers who were drivers to identify if the translations of the original 33 items were accurate in expression. After that, the typical traffic scenarios inducing drivers' anger in China were sorted and listed in the form of items through browsing drivers' BBS and carrying out an interview on different drivers. For example, adding items: "someone changes lane without turning on signal lights", "someone changes lane with crossing the solid white line at an intersection", "someone parks his car illegally on the road", "non-motor vehicles occupy the lanes for motor vehicles", "someone parks his car illegally at intersections entrances and exits" and "novice drivers drive slowly on road".

Next, combining translated 33 items with added 6 items, an intial 39-item driving anger questionnaire was carried out a survey on 10 experienced school-bus drivers who had driving experience over 10 years. After finishing the questionnaire, 10 drivers marked items

with ambiguous expression or inducing low anger and gave their suggestions. All things considered, we removed three items from the original DAS due to be not suitable to Chinese driving conditions, namely "someone makes an obscene gesture towards you", "someone beeps at you" and "police driving close by". Thus, on the basis of the original subscales in DAS, the factor "hostile gestures" was obsolete, and the other dimensions were reserved. Through modifying statement of expression, the factor "police presence" was renamed "traffic management and control". As a result, revised scale is divided into five dimensions: discourtesy, traffic obstructions, traffic management and control, illegal driving, and slow driving and made up of 36 items. Participants are asked to rate how angry they would become if they came across each situation listed in the scale. Ratings are made upon a Likert five-point scale (1 = not angry, 5 = very angry).

Type A Behavior Pattern Scale: According to Jenkins Aetirity Servey (Jenkins, Rosenman & Friedman, 1967), the pattern scale of the Type A behavior for Chinese people is a self-reported scale revised by Zhang (1985). Under repeated testing, the correlation coefficient of total scale score in two tests was over 0.5. Thus, the revised TABP had high test-retest reliability. The total questionnaire contains 60 items,consisting of three subscales, namely:TH (Time Hurry), including 25 items, emphasizes the urgency of time; CH (Competition Hostility), including 25 items, emphasizes the features such as being competitive, wary or hostile and so on; and L (Lie) which consists of 10 items about lie detection. Respondents were asked to indicate whether description of items fitted them. Tick for "Accept"and cross for "Refuse". Calculation methods determining types of personality are in the following. The first step is to calculate the L scale. If the total score is 7 points or higher, it indicates that the authenticity is not high, so we should eliminate the question. The evaluation criteria for the types of personality or behavioral characteristic depend on the score of TH plus CH. We define that type A: from 37 to 50 points; type A-: from 30 to 36 points; middle type: from 27 to 29 points; type B-: from 20 to 26 points; and type B: from 1 to19 points.

State-Trait Anger Expression Inventory-2: State-Trait Anger Expression Inventory-2 (STAXI-2) (Spielberger, 1999) was revised by Spielberger on the basis of the version of STAXI (Spielberger, 1988). The Chinese version of STAXI-2 with 57 items which was derived from the original English version by Tao (2009) was adopted. The STAXI-2 exhibits good internal consistency with Cronbach Alpha values ranging from 0.63 to 0.93. The anger expression–out scale (AX-O) (α=0.66) and the anger expression-in scale (AX-I) (α=0.75) were used as the subscales of STAXI-2 to measure trait propensities for anger. The AX-O measures whether or not to express anger feelings and aggression, and the AX-I measures whether to suppress the feelings of anger in the mind when experience anger. These two scales were used to screen out the anger-in, anger-out group and anger control group. Ratings are made upon a four-point scale (1= almost never; 4= almost always). The participants whose scores were higher than 16 in the anger-out scale were classified as anger-out group and scores are higher than 21 in the anger-in scale made up the anger-in group. The others belong to the anger-control group.

Driving behavior: The drivers are asked to report the total points and the numbers of being involved in accidents (both minor and major ones) in the last year, as well as their preferred driving speeds on three types of speed-limit roads (expressway with the speed

limit of 120km/h, highway with the speed limit of 80km/h, urban road with the speed limit of 60km/h).

Finally, the questionnaire also included demographic characteristics such as gender, age and driving information such as driving experience, mileage of last year.

2.2 Participants

The study included 150 drivers (all males) from the Hefei Passenger Transportation Co. Ltd in China. All are inter-city bus drivers. Some drive medium distance between the cities within Anhui Province, and some drive long-distance inter-province routes. These drivers mainly engage in average 8 to 11 hours' driving every work day. All drivers drive at least 150 km one-way when on duty. In total, 150 questionnaires were distributed and 132 responses were valid, giving a validity rate of 88%.

2.3. Procedure

The 150 professional drivers representing different bus lines were randomly sampled and convened in a conference room to complete the survey. Methods of filling out three scales were explicitly explained by the researchers before the survey is taken.The whole questionnaire was filled in by the drivers in the form of self-report and whole process was anonymous. All the three copies of scale should be filled in completely and incomplete survey sheets were discarded. Because of questionnaire survey as a part of the performance appraisal for professional drivers who were participants, they didn't receive any remuneration.

3. Results

3.1 Demographics and descriptive variables

Table 1 shows the basic information of the professional drivers who took part in the survey, such as age, driving experience, mileage in the past year and so on. Participants were all male and aged from 32 to 56 years old (mean=43.01, SD=5.12). They had between 5 and 39 years experience driving cars, with the average being 20 years. As the drivers were from the same company, all of the participants' ages, driving experience, and mileages in the past year are relatively concentrated, with the standard deviation from 5 to 7.

Participants were also asked to indicate their preferred driving speeds on three different types of roads: expressway, highway and urban road (Table 1). The preferred speed of professional drivers on expressways was often within the speed limit, and the average speed was 99.96 km/h (SD = 8.48), which was far lower than the speed limit of 120 km/h. But participants tended to drive fast on highways and urban roads with the speed limits of 80 km/h and 60 km/h respectively. Some were found to go over the speed limit, but not too much.

In Table 1, the number of traffic accidents the participants involved in the past year and the total penalty points received for violations are also presented. In summary, participants reported being involved in only a small number of traffic accidents (M=0.36; SD=0.60), about 25% of the drivers had the experience of receiving penalty points (M = 1.11; SD = 2.16).

Table 1

Demographics and descriptive variables

Variable	Means(SD)	Range
Age	43.01(5.12)	32~56
Driving experience	18.98(6.61)	5~39
Mileage in the past year（10^4km）	15.46(6.25)	2~35
Preferred speed on expressway（120km∕h）	99.96(8.48)	80~120
Preferred speed on highway（80km∕h）	70.18(8.32)	50~95
Preferred speed on urban road（60km∕h）	51.18(8.11)	25~80
The number of traffic accidents in the past year	0.36(0.61)	0~3
Penalty points in the past year	1.11(2.16)	0~9

3.2. Reliability and validity test of the driving anger scale

The analysis of item-total correlation, principal components analysis (PCA) and reliability and validity test were conducted by using SPSS19.0. Internal consistency reliability, as the name implies, is concerned with the homogencity of the items within a scale. In general, internal consistency is typically equated with Cronbach's coefficient alpha which is widely used as a measure of reliability. In order to have a good validity, an item or scale is required to have only an empirical association with some criterion or "gold standard" (Devellis, 1991).

First, for item-total correlation, namely the correlation coefficient r between each item and the total scale score should be more than 0.4; and then as the item differentiation index, the correlation must reach the significant level $p < 0.01$. As a result, two items namely item 16 and 26 were removed and the remaining 34 ones were kept, which were shown in Table 2.

Table 2

Correlation analysis of each item to the total score (r)

Item	Item-to-total-score	Item	Item-to-total-score	Item	Item-to-total-score	Item	Item-to-total-score
1	0.44**	10	0.46**	19	0.58**	28	0.54**
2	0.42**	11	0.68**	20	0.54**	29	0.52**
3	0.51**	12	0.47**	21	0.44**	30	0.61**
4	0.44**	13	0.74**	22	0.53**	31	0.52**
5	0.59**	14	0.74**	23	0.60**	32	0.65**
6	0.59**	15	0.56**	24	0.63**	33	0.48**
7	0.65**	16	0.38**	25	0.47**	34	0.53**

| 8 | 0.66** | 17 | 0.53** | 26 | 0.38** | 35 | 0.51** |
| 9 | 0.59** | 18 | 0.53** | 27 | 0.54** | 36 | 0.53** |

*$p<0.05$, **$p<0.01$

To determine whether the remaining 34 items was reliable and valid for Chinese professional drivers, data obtained were subjected to the exploratory factor analysis. Exploratory analysis was adopted rather than confirmatory because of the changed wording for some of the questions and removal of inappropriate questions. Principal Component Analysis (PCA) as a major method was carried out to determine the factor structure, and the items were exposed to factor analysis (Varimax Rotation). KMO = 0.85, and the result of Barlett Test of Sphericity reached the significant level $p < 0.01$. Characteristic roots of seven factors were greater than 1, and the cumulative variance contribution rate was 62.91%. Considering the commonality, characteristic roots and factors loadings which were more than .40, after repeated comparisons, we further removed 4, 5, 8, 9, 10, 13, 14, 15, 19, 21, 27, 28, 29, 34 and 35, 15 items in total. When removing these items, special attentions were paid to make sure that the factor loading of each item was greater than 0.45, and each dimension contained at least three items.

The remaining 19 items went through the principal component factor analysis. KMO=0.78, and the result of Barlett Test of Sphericity reached the significance level P < 0.01. Characteristic roots of four factors were greater than 1, and the cumulative variance contribution rate was 60.42%. The four factors were named: discourtesy, traffic obstructions, illegal driving and slow driving. They could explain respectively the variations: 17.21%, 15.39%, 15.38% and 12.43%. The load of each item under each factor is shown in Table 3.

Table 3

The loads of factors in the scale

Item	Discourtesy	Item	Traffic obstructions	Item	Illegal driving	Item	Slow driving
20	0.753	30	0.715	12	0.758	2	0.824
17	0.736	18	0.699	25	0.682	3	0.769
24	0.687	33	0.635	36	0.675	1	0.606
6	0.658	32	0.589	31	0.640		
11	0.591	22	0.569	23	0.610		
7	0.538						

Reliability analysis of the revised scale was also conducted. The Cronbach Alpha value of internal consistency of the total scale was 0.876, and the internal consistencies of four dimensions were respectively: 0.85(discourtesy), 0.74 (traffic obstructions), 0.78(illegal driving) and 0.72(slow driving). The Cronbach Alpha value is 0.7 or more, which indicates acceptable reliability (Nunnally, 1978). The results proved that the modified scale had good internal consistency reliability.

The validity analysis of the scale was carried out. The results of the correlation tests

between each factor and the total score in the revised driving anger scale are shown in Table 4. As can be found, the correlation among various factors are low to lower medium, which indicates the scale had a good differential validity. There is also a high degree of consistency between the content tested in the total scale and that in each factor, which indicating the revised scale has good criterion-related validity.

Table 4

The correlation matrix between factors of the scale and the total score

Factor	Discourtesy	Traffic obstructions	Illegal driving	Slow driving	The total score
Discourtesy	1.00				
Traffic obstructions	0.49**	1.00			
Illegal driving	0.46**	0.49**	1.00		
Slow driving	0.53**	0.32**	0.17*	1.00	
The total score	0.84**	0.78**	0.76**	0.56**	1.00

$^*p<0.05,^{**}p<0.01$

3.3 The induction of driving anger

The means and standard deviations of the 19-item driving anger scale were presented in Table 5. Results shown that in the group of professional drivers, traffic obstructions as a inducing factor of driving anger had the highest score among the four factors, with a subscale score of 2.78 (SD = 0.89). In addition, in the subscale, the item 33 "the reminding flag is not set when the road is on reconstruction" had a score of 3.23 (SD = 1.35), which became the highest score item inducing driving anger in the whole 19 items. Illegal driving is the second major factor to induce anger, in which the item 12 "other vehicles run a red light" became the second most anger-inducing scenario (M=3.18;SD=1.55) in the whole 19 items. Interestingly, the least angering situation was "a pedestrian walks slowly across the middle of the street, forcing you to slow down" (M=1.56; SD=0.80). It belonged to the slow driving subscale, which had the lowest average anger ratings (M=1.89; SD=0.67) of the four subscales.

On the whole, compared with the findings in the USA and Malaysia (Deffenbacher et al., 1994; Sullman et al., 2014), it was found that Chinese professional drivers reported less levels of anger than the USA and Malaysia drivers in similar subscales, though the number of these subscales was different. For example, in the discourtesy, traffic obstructions and slow driving scale, the scores of anger in the USA and Malaysia were over 3.06, but for Chinese professional drivers, levels of anger in the three subscales were all less than 2.78. Furthermore, the highest overall scale mean for the USA and Malaysia sample was the discourtesy scale, which was not for Chinese professional drivers.

Table 5

Means and standard deviations of the revised driving anger scale

Item no.	Item	M（SD）
	Discourtesy（α=0.84）	2.02（0.89）

6	Someone cuts right in front of you on the freeway.	1.79（1.17）
7	Someone cuts in and takes the parking spot you have been waiting for.	2.30（1.30）
11	Someone backs out in front of you without looking.	2.44（1.41）
17	Someone tries to speed up to drive in front of you.	1.65（0.92）
20	Someone changes lane in front of you when there is no one behind you.	2.08（1.09）
24	When you drive normally, someone honks at you.	1.89（1.12）
	Traffic obstructions（α=0.74）	2.78（0.89）
18	Other cars block traffic in the parking process.	2.69（1.19）
22	You hit an unmarked deep pothole when driving.	2.94（1.31）
30	You drive behind a badly smoking vehicle and the smoke blocks your sight.	2.48（1.27）
32	You drive behind a large truck which occupies the lane.	2.59（1.19）
33	The reminding flag is not set when the road is on reconstruction.	3.23（1.35）
	Illegal driving（α=0.78）	2.64（0.93）
12	Other vehicles run a red light.	3.18（1.55）
25	Someone is speeding on a speed-limit road.	2.34（1.22）
36	Someone changes lane with crossing the white line in an intersection.	2.25（1.14）
31	Someone parks his car illegally on the road.	2.77（1.27）
23	Someone changes lane without turning on signal lights.	2.64（1.16）
	Slow driving（α=0.72）	1.89（0.67）
2	A pedestrian walks slowly across the middle of the street, forcing you to slow down.	1.56（0.80）
3	Someone is driving too slowly in the passing lane.	2.34（1.06）
1	Someone in front of you does not start up when the light turns green.	1.74（0.68）
	Total driving anger（α=0.87）	2.36（0.67）

3.4 Anger by age, driving experience, mileage and the other descriptive variables

In order to examine the relationship between the subscales and total score of driving anger with the demographics such as age, driving experience and mileage in the past year, Pearson's correlation coefficients were calculated and the results are presented in Table 6. Though weak, the age, driving experience, and mileage in the past year were found positively correlated with the total driving anger score, which was inconsistent with the previous result of the non-professional drivers group in which older, more experienced drivers seemed to be less provoked in general (Feng-Zhi, Chang-Ji & Cheng-Lie, 2003; Jovanović, Lipovac, Stanojević & Stanojević, 2011).

By the analysis of the relationship between the driving anger subscales as well as the total driving anger score and the drivers' preferred driving speeds on three different roads, we could find out from the total scale score in Table 6 that the higher the drivers' preferred speeds were, the more easily the drivers were irritated. The drivers preferring higher speed

on expressways and urban roads are easily irritated by these three traffic scenes: other drivers' discourtesy, traffic obstructions and slow driving. However, the drivers preferring higher speed on highways are easily irritated by only two: discourtesy and slow driving.

Table 6

The correlation coefficients between driving anger and demographics, descriptive variables

	Discourtesy	Traffic obstructions	Illegal driving	Slow driving	Total DAS
Age(N=124)	0.106	0.002	0.053	0.030	0.070
Driving experience(N=126)	0.119	0.053	0.047	-0.004	0.085
Mileage in the past year （10^4km,N=90）	0.073	0.014	0.184	0.014	0.097
Preferred speed on expressway（120km∕h,N=123）	0.582**	0.248**	0.101	0.481**	0.445**
Preferred speed on highway （80km∕h,N=123）	0.269**	0.151	-0.007	0.287**	0.210*
Preferred speed on urban road （60km∕h,N=122）	0.307**	0.220*	0.026	0.334**	0.268**

* $p<0.05$，** $p<0.01$

3.5 Driving anger by penalty points and accidents

Mean scores and standard deviations in the driving anger subscales and the total scale were compared between the drivers who had either been involved in traffic accidents (both minor and major) or received penalty points in the past year and those who had not. The result was shown in Table 7. Independent t-tests showed that in the scale of total driving anger and the subscales of traffic obstructions and slow driving, there was no difference between the group with penalty points (N = 33) and the group without (N = 99). But in the subscales of discourtesy and illegal driving, obvious differences existed between the two groups and the drivers who had no penalty points were easier to be irritated than those who had.

The independent t-tests also were also conducted to analyze the differences between those drivers who had been involved in traffic accidents (N=40) in the past year and those who had not (N=92). The result shows that there exists a significant difference between the two groups in the subscale of discourtesy. The drivers who had not experienced traffic accidents in the last year got higher anger scores than those that had. In other subscales and the scale of total driving anger, there is no difference between the two groups.

Table 7

Driving anger, penalty points, and accidents

	Penalty points in the past year N=33,M(SD)	No penalty points in the past year N=99,M(SD)	t	p	Accidents in the past year N=40, M(SD)	No accidents in the past year N=92,M(SD)	t	p
Discourtesy	1.76（0.67）	2.11（0.93）	2.33	0.023*	1.73(0.65)	2.15(0.95)	2.92	0.004*
Traffic	2.85（0.95）	2.76（0.87）	-0.52	0.605	2.64(0.86)	2.85(0.90)	1.19	0.235

obstructions								
Illegal driving	2.32（0.91）		2.74（0.92）	2.27	0.025*	2.52(0.85)	2.69(0.97)	0.94	0.347
Slow driving	1.90（0.81）		1.87（0.65）	-0.27	0.791	1.87(0.89)	1.89(0.59)	0.14	0.891
Total DAS	2.22（0.55）		2.41（0.70）	1.60	0.113	2.20(0.57)	2.43(0.70)	1.84	0.068

*$p<0.05$, ***$p<0.005$

3.6 Driving anger and the Type A Behavior Pattern

In order to avoid the deviation of results by small sample in each group, the 132 participants were divided into three categories. According to the evaluation criteria of the Type A behavior pattern, type A and type A-, namely the total scores more than 30 were viewed as type A personality. The total scores from 27 to 29 were middle personality. Type B- and type B, the total scores below 27 were collectively called type B personality. In order to explore the differences among the three types of personalities in the driving anger subscales and the total score, an ANOVA was performed. As a result, the ANOVA revealed significant personality differences in overall levels of reported anger ($F(2, 129) = 4.52$, $p<0.05$). Furthermore, there existed significant personality differences in the discourtesy, traffic obstructions and slow driving scale respectively ($F(2, 129) = 3.68$, $p<0.05$; $F(2, 129) = 3.21$, $p<0.05$; $F(2, 129) = 4.99$, $p<0.01$). Then, Least Significant Difference (LSD) method for multiple comparisons was performed to conduct pairwise comparisons, and the results were shown in Table 8.

Post Hoc tests found in the total scale, discourtesy, traffic obstructions and slow driving subscale, drivers with middle personality reported significantly higher levels of anger than the groups had type B personality ($p<0.05$), but not those with type A personality. Interestingly, there were significant differences between the drivers with type A personality and those with type B personality in the slow driving scale. When facing slow driving on the road, professional drivers who were induced significantly higher level of anger than those with type B personality.

Table 8

The result of multiple comparison tests

Driving anger	Type A N=64,M	Middle N=26,M	Type B N=42,M	F	p
Discourtesy	2.00	2.40	1.81	3.68	0.028*
Traffic obstructions	2.85	3.04	2.52	3.21	0.044*
Illegal driving	2.57	2.92	2.57	1.54	0.218
Slow driving	1.97	2.09	1.62	4.99	0.008**
Total scale	2.37	2.65	2.17	4.52	0.013*

*$p<0.05$, **$p<0.01$,

3.7 Driving anger and anger-out, anger-in groups

With the aid of the revised STAXI-2, there were 43 drivers in anger-out group and 9 drivers in anger-in group. The others belonged to the anger control group. The method of

ANOVA was adopted to conduct difference examination of the three types of group, and the results were shown in Table 9.

An ANOVA revealed that significant anger differences between the three types of group in the total DAS ($F(2, 129) = 21.93$, $p<0.001$) and four subscales of discourtesy, traffic obstructions, illegal driving and slow driving ($F(2, 129) = 27.30$, $p<0.001$; $F(2, 129) = 11.65$, $p<0.001$; $F(2, 129) = 4.74$, $p<0.01$; $F(2, 129) =9.88$, $p<0.001$). The LSD method of multiple comparisons was again used to conduct the pairwise comparisons. The result indicated that in the discourtesy scale, the professional drivers of anger-out group had higher anger scores than anger-in groups and anger-control groups. And in other subscales and the total driving anger scale, there was no obvious difference between the anger-out group and the anger-in group, but significant differences existed between the anger-out group and the anger-control group. In other words, drivers in the anger-out group had higher anger scores than those in the anger-control group. Only in traffic obstructions subscale and the total scale the anger-in groups reported significantly higher levels of anger than the anger-control groups, in other subscales, there were no significant differences between them. That was, the anger-control groups had the lowest levels of anger on the road.

Table 9
The results of multiple comparison tests

Driving anger	Anger-in N=9,M	Anger-control N=80,M	Anger-out N=43,M	F	p
Discourtesy	2.15	1.65	2.69	27.30	0.00****
Traffic obstructions	3.51	2.51	3.13	11.65	0.00****
Illegal driving	3.07	2.44	2.91	4.74	0.01*
Slow driving	1.93	1.69	2.23	9.88	0.00****
Total scale	2.71	2.09	2.79	21.93	0.00****

*$p<0.05$, ****$p<0.001$

3.8 Predictors of the driving anger factors

Multiple regressions were used to explore the influences of some variables on the four types of driving anger. Because age, driving experience and mileage showed weak correlation with driving anger, these factors had not been put in the regression. Thus, in each regression, the preferred speed on expressway, highway and urban road, types of personality about TABP and types of personality about anger expression were entered into the model using the stepwise selection method, with a probability of F to enter of 0.05. Table 10 showed that anger induced by discourtesy was predicted by the preferred speed on expressway and types of personality about anger expression. Types of personality about anger expression predicted anger evoked by traffic obstructions and illegal driving. Anger caused by slow driving could be predicted by the preferred speed on expressway. As a whole, preferred speed on expressway and types of personality about anger expression became important variables to predict anger on profeesional drivers.

Table 10

Prediction of the driving anger factors

Step	Variable	R^2	ΔR^2	*F*	Beta
Discourtesy					
1	preferred speed on expressway	.350	.350	64.65****	.417****
2	Types of personality about anger expression (control=1; in=2;out=3)	.406	.056	40.69****	.294***
Traffic obstructions					
1	Types of personality about anger expression	.100	.100	13.31****	.316****
Illegal driving					
1	Types of personality about anger expression	.063	.063	8.11**	.252**
Slow driving					
1	preferred speed on expressway	.228	.228	35.47****	.478****

$^{*} p<0.05,$ $^{**} p<0.01,$ $^{***} p<0.005,$ $^{****} p<0.001$

4. Discussion

This paper presented a research on driving anger in China by using the professional driver's group as a case. By using the data, a revised version of DAS was produced on the basis of rational (for example, significance and suitability to the characteristics of the subscale concerned) and empirical criteria (for example, item-total correlation, principal components analysis and reliability and validity test). The total scale consists of 19 items, containing 4 factors (discourtesy, traffic obstructions, illegal driving and slow driving), which was considerably different from the factor structure found in the USA, UK, New Zealand and so on (Deffenbacher et al., 1994; Lajunen et al., 1998; Sullman, 2006). In many Chinese cities, traffic is characterized by a strong mixed mode with motor vehicles, non-motor vehicles and pedestrians all competing with each other on road. Under mixed traffic patterns, Chinese drivers behave quite differently. Furthermore, because of different culture, the traffic situation "someone makes an obscene gesture towards you" seems to seldom happen on the road. As a result, studies conducted in western countries may not be applicable to Chinese situations. Additionaly, drivers from different geographical areas in China may also vary in driving behavior. Thus, there is variation in the underlying structure of the scale.

This study unveiled which traffic scenarios would evoke driving anger in the professional driver's group in China. Using the revised DAS, the level of driver anger reported here was found that "traffic obstructions" scored highest among the four traffic scenarios inducing driving anger, which was different from previous studies conducted in other countries where "drivers reported highest anger propensities for the discourtesy subscale" in the U.S. (Deffenbacher et al., 1994), New Zealand (Sullman, 2006), France (Villieux & Delhomme, 2010), Turkey (Yasak & Esiyol, 2009), and the UK (Lajunen et al., 1998). In the subscales, the item "the reminding flag is not set when the road is under

construction" was the highest score item inducing driving anger among all items.To professional drivers, they worked as drivers in transport companies to have to carry out most of their driving in relation to tight time schedules, even the demand of the passengers, which might account for the phenomenon why appeared traffic obstructions evoked the highest levels of anger. On the contrary, the least anger provoking situation was "a pedestrian walks slowly across the middle of the street, forcing you to slow down," which belonged to slow driving subscale. In the authors' opinion, it might imply that professional drivers tend to give a socially acceptable response rather than from expressing their true opinion. However, there was also an inconsistency with findings the lowest level of anger was evoked by "police presence" amongst sample of drivers from Malaysia (Sullman et al., 2014), along with drivers in New Zealand (Sullman, 2006), Spain (Sullman et al., 2007) and France (Villieux & Delhomme, 2010).

The levels of driver anger that all subscales evoked in Chinese professional drivers sample were less than 3. And in each subscale and the total driving anger scale, the level of driver anger reported was significantly lower that found in the USA (Deffenbacher et al., 1994) and Malaysia (Sullman et al, 2014). The findings had similarities to research by Liu et al. (2013) who found that Chinese drivers' driving anger level was significantly lower than that of German drivers, and the level of driver anger was more than 3 just in one item.

In the present study, as to the relationship between demographics and the total driving anger scale as well as each subscale, this study did not reveal effects of age, driving experience, and mileage on driving anger. There had already been some contradictory findings and these findings were somehow inconsistent with the results derived from the non-professional driver's group that older, more experienced drivers seem to be less provoked anger in general (Lajunen et al., 1998; Sullman, 2006; Sullman et al., 2007). However, Parkinson (2001), Yasak and Esiyok (2009) in their study reported that age was not correlated with either driving anger scales, and Li and Zhan (2003)found there was no significant relationship between driving anger and age, driving experience. In general, correlation between demographics and driving anger was affected by geographical areas and particularly selected sample (sample size and classification) to a large degree. Thus, in present study, the sample as professional drivers, it existed certain homogeneity in age, driving experience and mileage, and using revised DAS with very different factor structures and items, which might all contribute to non-significant correlation.

As for the impact of preferred driving speed on driving anger, as was to be expected, professional drivers who reported higher speed were more likely to become angry than the slower. The finding was in line with previous research in New Zealand (Sullman, 2006), Spain (Sullman et al., 2007) and Malaysia (Sullman et al., 2014).Therefore, it appeared that driving anger was more common for drivers who prefer driving faster and this phenomenon is not restricted to professional or non-professional driviers ,specific locations and cultures.

Another notable finding in this study was that personality factor from type A personality, type B personality and middle personality had influenced on driving anger. Surprisingly, on the whole sample, about 50% profeesional drivers had type A personality tendency.It might be that tight time schedules contributed professional drivers' type A personality. It showed that professional drivers who had type B personality reported lowest anger on the road.Only facing the traffic conditions of slow driving, professional drivers

who had type A personality were induced significantly higher level of anger than those type B personality. This phenomenon might result from typical behavioral characteristics of type A personality were described as aggressiveness and a strong sense of time urgency. Thus, type A personality as a kind of dangerous personality factor affected driving anger.

Analysing the driving anger among the anger-out, anger-in and anger-control group, it was found anger-control group reported the lowest driving anger compared with other groups.Though the anger-in group hided anger in their mind instead of venting anger to others, they still reported higher anger than the anger-control group, even than anger-out group at times. Thus, the anger-in group and anger-out group should be given the equal attention in interventions to driving anger. In short, controlling ability as a better way is helpful to reduce the level of professional drivers' anger.

In previous studies (Sullman et al., 2007; González-Iglesias et al., 2012), driving anger was viewed as a variable that could predict aggressive driving, traffic accidents and traffic violations. In present study, the factors could predict driving anger was investigated among professional drivers. This research found types of personality about anger expression, preferred speed on expressway could positively predict professional drivers' anger evoked on the road. Those had an inconsistency with findings by Lajunen et al (1998) who found self-evaluated safety skills, perceptual-motor skills, age and mileage were important predictors to driving anger and Sullman (2006) concluded for New Zealand drivers, speed, Centre size, age and mileage predicted driving anger significantly. Due to non-significant correlation between demographics and driving anger, demographics variables were removed from multiple regressions. It revealed that when selecting professional drivers, people who preferred driving fast and belonged to anger-out, anger-in groups would be considered carefully.

4.1 Limitations

The present study still has some limitations to be considered when the results are interpreted. As the present study is based upon drivers' self-reported data, it suffers from social desirability bias. Though participants were all assured of total confidentiality and anonymity and even in the process of testing they were geographically separated from the researchers, the usual weaknesses of questionnaire on research could not be avoided. In future work, improving the surveying technique is of equal importance. Thus, access to individual driving records may provide objective outcomes confirming self-reported information and reducing concerns about a potential response bias.

In addition, in present study another potential limitation is the number of sample. Professional drivers as special group whose number is much less than the non-professional, so it is found to be of certain difficulties to investigate more professional drivers within a short time. In further work, the number may be enlarged by realizing the diversification and the generalization to professional drivers.

In this research, the authors were only able to take the professional driver's group as a case study to investigate the Chinese version of DAS. Professional drivers may behave differently from non-professional drivers when facing similar or identical traffic scenarios, therefore, the findings may be limited in generality. A more comprehensive survey is needed with the focus on general drivers.

Finally, due to the limitation of age range in Chinese drivers, and even for professional drivers, the range of professional drivers' age, driving experience and mileage are narrower than other studies' sample (Sullman et al., 2014;). In future work, it is important to enlarge the field of drivers' demographic background when selecting sample.

4.2 Practical implications and directions for further research

Professional drivers as an important group usually use the roads in the daily life. This research tends to develop a localized version of DAS and shed light on some unique characteristics of driving anger for professional drivers in China. The findings of this research may assist the corresponding agencies in developing more effective traffic control and management polices, and in enhancing the existing driver education program to improve safety. For instance, "the reminding flag is not set when the road is under construction" and red light running were found to be most and second anger provoking among professional drivers, which implies the urgency of work zone management and necessity of revisiting the enforcement policies against red light running. For professional drivers as a special group, conducting tentative and targeted interventions to driving anger and aggressive driving are inportant in future work. When it comes to the selection and training strategy for professional drivers, the personality factors and preferred speed should be considered as important criteria.

References

Arnold, M. B., & Plutchik, R. (1964). The emotions: facts, theories and a new model. *American Journal of Psychology, 77*(3).

Benfield, J. A., Szlemko, W. J., & Bell, P. A. (2007). Driver personality and anthropomorphic attributions of vehicle personality relate to reported aggressive driving tendencies. *Personality & Individual Differences, 42*(2), 247–258.

Björklund, G. M. (2008). Driver irritation and aggressive behaviour. *Accident Analysis & Prevention, 40*(3), 1069-1077.

Broughton, J., Baughan, C., Pearce, L., Smith, L., & Buckle, G. (2003). Work-related road accidents. *Crowthorne: Transport Research Laboratory*.

Bortner, R. W. (1969). A short rating scale as a potential measure of pattern a behavior. *Journal of Chronic Diseases, 22*(22), 87-91.

Deffenbacher, J. L., Deffenbacher, D. M., Lynch, R. S., & Richards, T. L. (2003). Anger, aggression, and risky behavior: a comparison of high and low anger drivers. *Behaviour Research & Therapy, 41*(6), 701–718.

Deffenbacher, J. L., Lynch, R. S., Oetting, E. R., & Yingling, D. A. (2001). Driving anger: Correlates and a test of state-trait theory. *Personality & Individual Differences, 31*(8), 1321-1331.

Deffenbacher, J.L., Lynch, R.S., Oetting, E.R., Swaim, R.C. (2002). The driving anger expression inventory: a measure of how people express their anger on the road. *Behaviour Research & Therapy, 40*(6),717-737.

Deffenbacher, J.L., Oetting，E .R., Lynch，R .S. (1994). Development of a Driving Anger Scale. *Psychological Reports, 74*(1), 83-91.

Deffenbacher, J. L., Richards, T. L., Filetti, L. B., & Lynch, R. S. (2005). Angry drivers: a test of state-trait theory. *Violence & Victims, 20*(4), 455-69.

Deffenbacher, J. L. (2003). Anger, aggression, risky behavior, and crash-related outcomes in three groups of drivers. *Behaviour Research & Therapy, 41*(3), 333–349.

Devellis, R. F. (1991). Scale development: Theory and application. *Applied Social Research Methods Series*. Newbury Park, CA: Sage.

Dorn, L., Stephen, L., af Wåhlberg, A., & Gandolfi, J. (2010). Development and validation of a self-report measure of bus driver behaviour. *Ergonomics, 53*(12), 1420-1433.

Elander, J., West, R., & French, D. (1993). Behavioral correlates of individual differences in road-traffic crash risk: An examination of methods and findings.*Psychological bulletin, 113*(2), 279.

Evans, G. W., Palsane, M. N., & Carrere, S. (1987). Type a behavior and occupational stress: a cross-cultural study of blue-collar workers.*Journal of Personality & Social Psychology, 52*(5), 1002-1007.

Feng-Zhi, L., Chang-Ji, L., & Cheng-Lie, Z. (2003). The reliability and validity of aggressive driving questionnaires in Chinese version. *Chinese Journal of Behavioral Medical Science, 12*(3), 335-337.

Friedman, M., & Rosenman, R. H. (1959). Association of specific overt behavior pattern with blood and cardiovascular findings; blood cholesterol level, blood clotting time, incidence of arcus senilis, and clinical coronary artery disease. *Journal of the American*

Medical Association, 169(12), 1286-96.

Funkenstein, D. H., King, S. H., & Drolette, M. (1954). The direction of anger during a laboratory stress-inducing situation. *Psychosomatic Medicine, 16*(5), 404-13.

González-Iglesias, B., Gómez-Fraguela, J. A., & Luengo-Martín, M. Á. (2012). Driving anger and traffic violations: gender differences.*Transportation Research Part F Traffic Psychology & Behaviour, 15*(4), 404–412.

Jenkins, C. D., Rosenman, R. H., & Friedman, M. (1967). Development of an objective psychological test for the determination of the coronary-prone behavior pattern in employed men. *Journal of Chronic Diseases,20*(6), 371-379.

Jovanović, D., Lipovac, K., Stanojević, P., & Stanojević, D. (2011). The effects of personality traits on driving-related anger and aggressive behaviour in traffic among Serbian drivers. *Transportation Research Part F Traffic Psychology & Behaviour, 14*(1), 43-53.

Lajunen, T., Parker, D., & Stradling, S. G. (1998). Dimensions of driver anger, aggressive and highway code violations and their mediation by safety orientation in UK drivers. *Transportation Research Part F: Traffic Psychology & Behaviour, 1*(2), 107-121.

Li, F. Z., Li, C. J., & Zhan, C. L. (2003). The reliability and validity of aggressive driving questionnaires in Chinese version. *Chinese Journal of Behavioral Medical Science,12*(3), 335-337.

Liu, R. Z., Zhou, R. L., & Oeh, M. (2013). Driving angry behavior of drivers in Mainland China and and Germany. *Chinese Journal of Ergonomics,19*(1),10-15.

Magnavita, N., Narda, R., Sani, L., Carbone, A., Lorenzo, G., & Sacco, A. (1997). Type A behaviour pattern and traffic accidents. *British journal of medical psychology, 70*(1), 103-107.

Maxwell, J. P., Grant, S., & Lipkin, S. (2005). Further validation of the propensity for angry driving scale in British drivers. *Personality & Individual Differences, 38*(1), 213–224.

NHTSA. (2007). Traffic safety facts 2007: a compilation of motor vehicle crash data from the fatality analysis reporting systemand the general estimates system. *Washington DC: National Highway Traffic Safety Administration*, 32-43.

Nesbit, S. M., Conger, J. C., & Conger, A. J. (2007). A quantitative review of the relationship between anger and aggressive driving. *Aggression & Violent Behavior, 12*(2), 156-176.

Nunnally, J. C. (1978). An overview of psychological measurement. In *Clinical Diagnosis of Mental Disorders*: A Handbook (ed. B.B. Wolman), 97-146. Plenum Press: New York.

O'Brien, S. R., Tay, R. S., & Watson, B. C. (2002). An exploration of Australian driving anger. In: Road Safety Research, Policing and Education Conference, Adelaide, South Australia.

Öz, B., Özkan, T., & Lajunen, T. (2010). Professional and non-professional drivers' stress reactions and risky driving. *Transportation Research Part F Traffic Psychology & Behaviour, 13*(1), 32-40.

Parker, D., Lajunen, T., & Summala, H. (2002). Anger and aggression among drivers in three European countries. *Accident Analysis & Prevention, 34*(2), 229-35.

Parkinson, B. (2001). Anger on and off the road. *British Journal of Psychology, 92*(92),

507-26.

Perry A. R (1986). Type a behavior pattern and motor vehicle drivers' behavior. *Perceptual & motor skills, 63*(2), 875-878.

Perry, A. R., & Da., B. (2000). Further evidence of associations of type a personality scores and driving-related attitudes and behaviors. *Perceptual & Motor Skills, 91*(1), 147-154.

Sohu. (2008). Survey results: 60 percentage of motorcar owners experienced ''road rage''. http://auto.sohu.com/20080513/n256816082.shtml. Accessed, October 2014.

Spielberger, C. D. (1988). State-Trait Anger Expression Inventory (STAXI). *Research edition. Odessa, FL: Psychological Assessment Resources*.

Spielberger, C. D. (1999). Staxi-2: state-trait anger expression inventory-2; professional manual. *Odessa, FL: Psychological Assessment Resources*.

Sullman, M. J. M. (2006). Anger amongst New Zealand drivers. *Transportation Research Part F Traffic Psychology & Behaviour, 9*(3), 173–184.

Sullman, M. J. M., Gras, M. E., Cunill, M., Planes, M., & Font-Mayolas, S. (2007). Driving anger in Spain. *Personality & Individual Differences,42*(4), 701–713.

Sullman, M. J., Stephens, A. N., & Yong, M. (2014). Driving anger in Malaysia. *Accident Analysis & Prevention, 71*(2), 1-9.

Sun, L. (2009). A study on bus drivers: The relationship among A-type personality, driving behavior and accident. *Master's Thesis.*

Tao, H. Y. (2009), Revise of State-Trait Anger Expression Inventory and analyse of the coping style among anger-out gruoup and anger-in. *Master's thesis.*

Underwood, G., Chapman, P., Wright, S., & Crundall, D. (1999). Anger while driving. *Transportation Research Part F Traffic Psychology & Behaviour, 2* (99), 55-68.

Villieux, A., & Delhomme P. (2010). Driving anger and its expressions: further evidence of validity and reliability for the driving anger expression inventory French adaptation. *Journal of Safety Research, 41*(5), 417–422.

Yasak, Y., & Esiyok, B. (2009). Anger amongst Turkish drivers: Driving Anger Scale and its adapted, long and short version. *Safety science, 47*(1), 138-144.

Zhang, X. F., Tao, H. Y., Qiao, M. Q., & Zhang, H. Y. (2011). Analyse of the medical students,coping style among anger-out group and anger-in group. *Liaoning Journal of Traditional Chinese Medicine, 38*(1),32-33.

Zhang, B. (1985). Psychophysiological reaction in cardiovascular disease：Ⅱ. a study on the behavior pattern of coronary heart disease patients. *Acta Psychologica Sinica, 3*(12):314-321.