Driver Behavior at Urban Roads in China

Focus Group Findings

Li Jie

Department of Traffic and Road Engineering, Civil Engineering College, Hunan University, Lushan South Road, 410082 Changsha, Hunan Province, PR China
Tel.:+86 13017312752; fax:+86 731 88822667.
email: ljlj369@msn.com

Henk J. van Zuylen

Department of Transport & Planning, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Stevinweg 1, 2628 CN Delft, The Netherlands,
Tel.: +31 626158161
e-mail: h.j.vanzuylen@tudelft.nl

Elisabeth van der Horst

Department of Transport & Planning, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Stevinweg 1, 2628 CN Delft, The Netherlands,
e-mail: elisabeth_vander_horst@hotmail.com

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ABSTRACT

Driver behavior in China shows remarkable differences from that in western countries. In this study, six focus groups were organized to investigate Chinese drivers’ attitudes, expectations, intended actions, their preferences, and habits in different situations in urban areas. The outcomes show that there are important opportunities to improve driver behavior, leading to safer and more efficient traffic.

Driver behavior–related simulation models have been developed for traffic plan, evaluation and design purpose. Most of these models consider relatively ideal driver behavior in western countries in the – for them common - traffic conditions. This study shows what modifications and calibration are needed to make such models valid for Chinese traffic.

Keywords: Focus group; Driver behavior; Traffic Offences; Traffic Priority Rules; China
INTRODUCTION

In the past decades, various algorithms have been developed to model driver behavior in given traffic conditions. Driver behavior, strongly related to the traffic capacity, safety and variability, is an important component of simulation models. These models usually have many parameters to represent drivers’ characteristics such as: desired acceleration/ deceleration, critical gap, safe distance, desired speed and so on. However, there is not much literature related to the influence of local traffic conditions on driver behavior and the improvement of existing models based on the driving custom.

China became the second biggest vehicle country and the largest vehicle market in the world from 2011. The vehicle ownership and the number of drivers both increased in the past decade (1). The driving custom and behavior in China differ from these in western countries, which spent more than 100 years to achieve the present road traffic development level. Field observations have shown that the saturation flow rates at Chinese signalized intersections are about 20% to 30% lower than the values at similar intersections in The Netherlands (2). Deeper insight into the driver behavior in China is expected not only to offer significant information to adjust the driver behavior models, but also find effective measures to improve traffic performance in China.

Investigations on driver behavior are usually based on external observations, such as vehicle trajectories, video observation, and surveys, which all cannot provide information with regard to drivers’ attitudes and opinions. Focus groups can shed some more light on these issues. Another stimulus to organize focus group discussions on driver behavior in China came from a survey with questionnaires executed in 2013 in China and The Netherlands at the same time (1). The comparison shows remarkable differences in driver behavior in these two countries. The research questions for this study are which factors have a large influence on driver behavior in China and how driver behavior can be improved.

Focus group discussions are an appropriate method to collect relevant information. Focus groups go back to the 1930s when social scientists wanted to move from close-ended interviews to open discussions. Focus groups became increasingly popular because they can assist in understanding how people feel or think about an issue. Focus groups create a permissive environment that helps participants to feel comfortable and disclose themselves (3).

In this study, focus groups were used to

• Get insight into the factors influencing driver behavior in urban traffic condition,
• Understand changes of driver behavior in different traffic conditions from the drivers’ perspective,
• Investigate drivers’ perceptions concerning vehicle interactions, traffic rules and especially priority rules.

The results can give directions to adjust existing driving models implemented in micro simulators or programs. Lastly, results can provide information on how to improve driver behavior, traffic management and traffic performance in urban areas.

The following section summarizes literature related to existing driving models, driver behavior investigations, and focus group research related to driver behavior. Next, a description of the focus group experiment is presented. The following section summarizes participants’ discussion on the driver behavior on five different aspects. Finally, the last section gives some conclusions.
LITERATURE REVIEW

The literature review in this study mainly refers to three topics: driving models, driver behavior investigations, and focus group studies associated with drivers. For every topic, many studies have been carried out in the past. In this section, only the studies strongly related to driver behavior investigation are considered.

Studies about driving models have a practical application in micro-simulators, and the analysis of traffic safety and capacity. Most existing models explain driver behavior with variables related both to the personal attributes (e.g. desired speed, desired acceleration and deceleration) and to surrounding vehicles (e.g. relative speed and distance). However, most available models ignore some aspects of human attitudes and actions such as: perceiving stimuli, evaluating alternative control actions, selecting an appropriate control action, and carrying out this action.

In the commercial microscopic simulation programs, like CORSIM, VISSIM (4), S-Paramics (5), AIMSUN(6,7), and FOSIM (8) the movements of individual vehicles can be simulated with different parameter settings. For example, in FOSIM, five different types of driver/vehicle combinations are distinguished with different parameter values. In S-Paramics, besides the different types of vehicles, different driving types are characterized by aggression and awareness factors. Similarly CORSIM can distinguish 10 different kinds of drivers. In VISSIM two different specifications of the Wiedemann (8) car-following model can be selected. In a simulation model, all drivers drive according to the same car following model but differences may exist in the parameter values for each group of drivers to represent their specific, e.g. aggressive or non-aggressive driving (10).

There are several frequently used methods for the investigation of driver behavior. Driver behavior observed on the road can be considered as unfeigned, but is usually limited to the short time period of data gathering (e.g. video observation, trajectory analysis) and a limited number of drivers (e.g. probe vehicle). A simple way of measuring driver behavior is to have a Driver Behavior Questionnaire (DBQ) survey on the drivers what are their typical behavior attitudes in driving (11,12,13,14,15). But these investigation methods can’t provide too much information with respect to drivers’ opinion and thinking process.

Focus group discussion is a practical way to obtain qualitative information about drivers’ perception. At the beginning, focus group discussion was often used by social scientists, and then became popular in driver behavior study in the past decade. In Hong Kong, focus groups were used to investigate the attitudes, beliefs, and perceptions of the public towards red light cameras (16). Focus groups were also conducted to investigate commuter drivers’ perceptions of freeway level of service (17, 18). Sun, Kondyli et al. studied lane changing behavior and ramp merging behavior on freeways through focus group discussions, and furthermore the participating drivers were categorized according to their background information and verbal responses (19, 20).

From the view of theory, the understanding about driver behavior is critical to get valid simulation models. Focus groups can assist in understanding drivers’ attitudes and opinions about driver behavior, identifying what factors affect drivers’ decisions, consequently help people to find effective ways to improve driver behavior and traffic performance.
FOCUS GROUP EXPERIMENT DESIGN

This section describes the organization of the focus groups and presents the questions discussed during the sessions.

Setting up Focus Groups

The focus group study was organized in Changsha, a city of 7 million inhabitants in the middle of China. The participants were selected from respondents of the previous questionnaire study varying with respect to gender, age, driving experience and profession (21). In this questionnaire study, every candidate was required to complete a questionnaire which is explicitly described in (21). The questionnaire assembled information both on socio-demographic characteristics and driver behavior. Totally, 35 participants were invited to join six 2-hour focus groups respectively. In each session, participants were also required to complete two survey forms associated with lane changing and overtaking behavior.

Participants Socio-demographic characteristics

Totally 6 focus groups involving 35 participants (28 males and 7 females; range 25–50 years) are organized in this study. The largest proportion of vehicles driven by participants was reported to be their own vehicle (71.4%), and a small proportion was from a company or institute (22.9%) or others (5.7%), etc. The participants had different education background: Professional education 10 (28.6%), Bachelor 11 (31.4%), Master or higher than Master 6 (17.1%), and Others 8 (22.9%). Most of participants (25.7%) were Professional Persons; Administrative staff and Professional driver both constitute 20%. Most participants, i.e. 60%, stated they enjoy driving. There were only few participants don’t have special feeling or dislike for driving with the percentages of 28.6% and 11.4% respectively.

FOCUS GROUP QUESTIONS

Focus group discussions were around three categories questions: opening questions, practical questions and ending questions, which are all presented in this section. The opening question was designed to encourage people to start talking and make them feel comfortable. The practical questions included five application questions: car following, lane changing, overtaking, reaction to traffic signals, opinion about traffic rules and priority giving, which are all relevant to driver behavior models. The central idea of these practical questions was to identify the relevant factors and how these factors could influence driver behavior. The ending question ensured that all important topics have been covered.

The data from the focus groups contained (a) voice recordings of the 2-hours sessions, (b) questionnaire about socio-demographic characteristics and driving behavior, and (c) additional investigation tables filled in during the sessions.

Opening Questions

Q1: How do you think about Chinese people’s driving behavior? Why?

Most of participants thought Chinese drivers’ behavior is not so well in terms of the offenses and aberrant
driving behavior, like sudden or forced lane changing without indication light, no knowledge about priority rules in conflict area, etc. They presented several causes resulting in such behavior:

1) China entered the motorized vehicle era only about ten years ago, and the related education system, license examination system, and law system are all in a developing phase. The western countries have developed the whole system related to motorized traffic for more than 100 years. There are differences in driving culture and customs between China and more advanced countries.

2) In China, about one third of the drivers are novices who have limited knowledge to evaluate the driving environment and conditions compared with experienced drivers. So these novel drivers behave quite heterogeneously: some are quite aggressive and some drive too conservatively.

3) The traffic monitoring and management systems in China are also in development. Stricter monitoring can help drivers to develop better driving behavior. If the disobedience isn’t penalized, the consequence is that more drivers continue to infringe the rules.

Q2. Do you enjoy driving? Why?
21 of the 28 male participants denoted they enjoyed driving quite a lot with different reasons, for instance convenience, feeling of freedom, pleasure of sports, and the quiet private space. All 7 female participants expressed they dislike or don’t have special feeling with driving. The causes which lead to dislike driving are congestion, difficulty in parking, risk of accidents, etc. It can be concluded from these focus group discussions that most male drivers like driving; and most female drivers are the revers.

Q3. Is your driving style conservative or aggressive? What factor can influence your driving style?
Even most participants thought Chinese drivers’ driving behavior is not good, only 5 of the 35 participants admitted they are somewhat aggressive in driving and all the other participants considered themselves as a conservative or common driver. Participants explained that their driving style can be influenced by lots of different factors.

The mostly mentioned factors influencing driver behavior are traffic conditions, weather, driving task, and personal mood. In hurry and congested situations, the driving style can become more aggressive than in a normal situation. Most drivers admitted their driving style is strongly related to the local traffic rule enforcement system. Based on the discussions, the influence of personal mood on driving style can vary among different drivers. Some participants expressed a cheerful mood can make them more patient in driving. But there are also some participants who said they easily make some driving errors in a cheerful status. Some participants stated they become more aggressive when they are tired because they want to arrive at the destination as soon as possible; other participants expressed they would be more careful in driving to avoid traffic incidents when they are tired. So there is a large variation in the reaction of drivers from external and personal issues

Application 1: Car following behavior
In the focus group discussion, car following was explained as driving behind another vehicle on a short distance.
Q1. What factors do you think are most important in “car following”? Most of participants indicated ‘safe distance to the preceding vehicle’ is very important in car following situation. The identification of the ‘safe distance’ varies not only among different drivers, but also between different traffic situations. In order to prevent from forced lane changing in congested traffic condition, participants stated they prefer to keep a quite short distance with the preceding vehicle. But in an uncongested situation and driving at high speed, they fear a sudden lane changing in front of them made by an adjacent driver or a sudden braking of the preceding vehicle, so they are inclined to keep a larger headway, because the aberrant behavior at high speed can result in quite serious traffic accidents. These descriptions are consistent with the factual traffic phenomena: drivers keep quite short space headways in a bottleneck; but after passing the bottleneck, the drivers seem to relax and keep quite long headways.

In car following status, the experienced drivers stated they often try to keep a long distance from the preceding vehicle, because they want a better view so that they can make proper decisions in time. In order to have a wide view, they often drive along the marking line rather than in the middle of the lane. Compared with experienced drivers, novices concentrate mainly on the preceding vehicle and pay less attention to the whole traffic surroundings.

Experienced drivers described that they do not dare to accelerate quickly in dense traffic on up-hill road sections, because there is potential risk of rear collisions if the vehicle in front suddenly brakes and they still have their foot on the gas pedal. On a down-hill section, it is safe even driving at a high speed because drivers usually don’t have their foot on the gas pedal and can quickly brake.

Application 2: Lane Changing behavior

Q1. What factors do you think are most important in “lane changing”? Which kind of lane changing habits do you dislike? Do you accelerate or decelerate while making lane changing?

Most participants stated that the available safe gap is most important in lane changing. Participants listed the most frequent aberrant lane changing behavior: no indication light for lane changing, forced lane changing, and long-time driving on the marking between lanes.

Quite significant difference exists in lane changing behavior between male and female participants with respect to speed. Most male participants told that they always accelerate during lane changing because they want to finish the lane changing procedure as soon as possible. On the contrary, most female participants stated they are inclined to decelerate in lane changing with the reason they can easily stop lane changing at any moment if necessary. Also some participants stated that they often accelerate when changing lanes in free flow, and decelerate in dense flow. They explained the reason: in free flow a quick change of lanes is clear to drivers behind them and these drivers can react in good time if necessary; in dense traffic lane changing has to be done slowly because the gap to merge into has to be forced by pushing his car slowly into the other lane and more cooperation with the following vehicle is required.

Q2. Cooperation and competition in lane changing

The interactions between vehicles involved in lane changing can be described as either cooperation (the follower
courteously yields to create a gap and allows the leader to move to the front of him/her) or competition (the follower doesn’t acknowledge the intention of the leader, but the leader still try to make a gap for lane changing). In the focus group sessions, the participants are required to describe their actions in two scenarios.

**Scenario 1. You need to change lane**

*Do your actions differ between the following two lane changing situations: changing to the right lane or changing to the left? Does any difference exist between normal and congested traffic situations?*

Participants explained that lane changing to the most right lane was more difficult and required a longer gap than to the most left lane. One reason is based on the fact: the blind spot on the right side of the vehicle is larger than left side one (for a vehicle with the steer at left). The other reason is that the right lane generally has more disturbances, e.g. holes in the pavement, pedestrians, mopeds and electric bicycles. In conclusion, the critical gap for lane changing to the right side should be much larger than to the left side.

In urban areas, the difference in lane changing between different traffic situations is represented in the location where a lane changing decision is made. In dense flow, participants are concerned for less chance to change lane and start lane changing much earlier than in free flow conditions.

**Scenario 2. The other vehicle is changing lane, but there isn’t a sufficiently large gap in front of you.**

*Do your react differently between the following two lane changing scenarios:*

(a) You are in the most right lane and the other vehicle in the left lane is attempting to merge in front of you;

(b) You are in the median lane and the other vehicle is planning to merge in front of you.

For the first scenario, most participants showed they are willing to yield to create an available gap for a forced lane changing when they are in the most right lane because they think the driver changing lane to the right possibly wants to turn to the curb-side lane and exit this street. But they are not willing to create a gap to a forced lane changing when they are in the median lane because the other vehicle disturbs them to a certain extent. Few participants (6/35) denoted they don’t cooperate in any kind of forced lane changing.

**Q3. Likelihood of a lane changing**

In order to identify the importance of the potential factors to lane changing, participants were asked to evaluate the level of likelihood (from 1 to 5) of initiating a lane changing for each listed scenario according to their driving experience. For every given scenario, there are two different driving situations: commuting and leisure. The assumption of traffic environment is urban street with three lanes for each direction. The results are shown in Table 1.
TABLE 1 Likelihood of making a lane changing (1 = generally would not, 5 = generally would)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1.1.1. Commuting</th>
<th>1.1.2. Leisure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Importance (Max=5)</td>
<td>Importance Std</td>
</tr>
<tr>
<td>Stopped bus at a bus stop</td>
<td>3.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Vehicle merging into your lane</td>
<td>2.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Slow-moving vehicle ahead</td>
<td>4.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Shorter line of queuing vehicles in another lane</td>
<td>3.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Bus or truck in front of you</td>
<td>3.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Vehicle tailgating you</td>
<td>2.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Undesirable pavement conditions</td>
<td>3.6</td>
<td>1.4</td>
</tr>
</tbody>
</table>

The front slow-moving vehicle is the most important reason for a lane change. In commuting, stopped bus and preceding vehicle type (bus or truck) are the other two factors with quite high likelihood to stimulate a lane changing. Vehicle merging and vehicle tailgating both has a low likelihood of lane changing. The likelihood of lane changing in a leisure trip is much lower than in the trip for work in every given scenario, which proves again the driving behavior can vary to certain extent in terms of travel targets.

Application 3: Overtaking behavior

In the focus group discussion, overtaking is defined as passing another vehicle. Several topics are discussed in the focus group sessions.

Q1. What factors do you think are most important during “overtaking”? What kind of overtaking habit do you dislike?

Participants agreed that speed and wide view of the whole traffic surrounding are critical for overtaking. Some experienced drivers emphasized sufficient preparation work should be made to inform the preceding vehicle that it will be overtaken. They often signal with their headlights and the horn, even though these seem aggressive from western drivers’ view.

Participants also demonstrated several aberrant overtaking behavior, for instance still executing overtaking when the vehicle in front is also overtaking, and overtaking in spite of an insufficient gap.

Overtaking at the right side is quite common in urban areas in China. The participants gave several reasons:

1) There are often more lanes at urban streets than at a freeway, so forbidden overtaking at the right side is not a strict rule in urban areas;

2) Lots of drivers prefer to drive on the most left lane, which leads to no chance to overtake via the left lane;
3) The most left lane has fewer disturbances and better pavement than the most right lane, which both stimulate drivers to drive more often on the most left lane.

Q2. Cooperation and competition in overtaking
The participants were asked to describe their actions when they overtake on a dual carriageway or two way road. They explained that they follow the standard procedure (look for a gap, turn on the indicator, accelerate and change lane). Most of participants don’t think it is important to change back to the original lane in urban areas.

Participants also explained that they were not told that they should not stay on most left lane for a long time on urban roads in the driving lessons. These reasons all lead to the phenomenon that drivers use the most left lanes more often than the most right lane in China.

Application 4: Reaction to signal
Traffic management and driver behavior at intersections are critical for the performance of the whole network in urban areas. In the focus group sessions, drivers’ reaction to traffic lights is discussed through several key questions.

Q1. What are your reactions when you see the light turns to green and you are the first driver in the queue?
Most of participants expressed they will first release the brake, then check if there are still pedestrians in the conflict area, and finally accelerate.

Experienced drivers differ with novice drivers in the reaction to green light on the fact that they care about their vision at the beginning of a green phase. If their vision is obstructed by another vehicle, they do not dare to accelerate quickly because there are possibly some conflicting vehicles or pedestrians hidden. Most participants told that they are very careful in the beginning of green phase and do not dare to accelerate directly and quickly due to possible conflicting traffic flows.

Q2. What are your actions when you see the signal turning to yellow?
Many participants were not clear about the appropriate actions during the yellow phase. To this question, most participants expressed they should decelerate and stop; 9 participants stated they always speed up, 21 participants said they always decelerate, and only 5 participants indicated that their action depends on the speed and distance to the stop line.

Participants stated they never got any special instruction concerning the reaction to yellow phase in their driving license course and the coach often emphasizes to drive carefully and brake in any urgent case in the intersection area. Most participants agreed that crossing stop line during yellow phase is a potential cause for traffic accidents.
Q4. What factors can influence your reaction to traffic lights? Are you aware of some mistakes in your reaction to the signal?

Most participants presented the location of the signal can influence their reaction to signal to a certain extent. In China, signals are often installed on the far side of the intersection, rather than above or beside the stop line. Drivers’ view can be easily blocked by a bus, even by a SUV in dense traffic conditions. At some intersections, it is difficult to find the stop line, which can also influence the reaction to signals.

Many of participants admitted that, waiting for a signal, their attention can be easily distracted by some private activity, like their mobile phone, chatting with other passengers, etc. Five participants stated they had the experience to cross the stop line during the red phase because they only focused on the preceding vehicle and ignored the signal transition.

Q5. What is your attitude to a conflicting vehicle that is still remaining at the intersection at the beginning of green?

There were only 14 out of the 35 participants told that they always give priority to these conflicting vehicles in such scenario by driving slowly or around such vehicles, very few participants stated they will fully stop. Eighteen participants explained they will not give priority in case of other drivers behind them push them or if they are in a hurry. Three participants stated they never gave priority to the remaining conflicting vehicles.

To sum up, participants’ attitude to the remaining conflict vehicles at a signalized intersection is diverse and the priority rule in this situation is quite unclear to most drivers.

Application 5: opinion of traffic rules

Traffic rules, as an important component of traffic management, are not only critical to traffic safety, but also relevant to simulation models. Most simulation models comprise the official traffic rules, but in reality drivers disregard these rules in some cases. Several questions associated with traffic rules, especial with priority rules were discussed in the focus group sessions.

Q1. Tell some rules related to priority. Are these rules important? Why?

Most participants only expressed two priority rules: turning vehicles should always give priority to through going vehicles and vehicles should always give priority to pedestrians on a zebra. Only four participants knew that drivers should give priority to the vehicles coming from the right side.

The participants were required to rank the priority in three scenarios as shown as follows:
In China, the priority rules for un-signalized intersection (without priority sign or traffic police directing in field) are listed as follows:

1. Left side flow gives priority to right side flow;
2. Turning flow gives priority to through going flow;
3. Right turning gives priority to left turning vehicles if they are from the opposite direction.

When the condition can match more than one rule, the later rule should be implemented. For example, scenario (a) measures up both rule 1 and rule 2, the rule 2 should be enforced, i.e. vehicle 2 should give priority to vehicle 1.

But in most western countries, like The Netherlands – which was used as a comparison -, the priority rules for the same un-signalized intersection are simple, as described as follows:

1. Left side flow gives priority to right side flow;
2. Turning flow gives priority to the opposite through going flow.

In terms of these two different priority rule settings, the priority can be ranked as:

- Scenario (a): 1>3>2 (in European countries the sequence is 3>2>1>3, with courtliness in case this rule leads for grid-lock)
- Scenario (b): 1>2>3 (same in Europe)
- Scenario (c): 2>3>1 (in Europe 1>2>3)

There was only one participant who gave the correct answers for all three scenarios in terms of the Chinese priority rules. All the other 34 participants were not clear about the priority rules and even the experienced drivers said they never learned these priority rules. What was mentioned mostly in conflict situations in reality is ‘courtesy’, not only emphasized by driving coaches, but also by traffic police and newspaper, etc. Through the focus group discussion, all participants agreed on the importance of such priority rules, and they also found that the rules in western countries are much easier to be applied in practice.

Q2. Do you know some priority traffic signs? Do you see them in reality?

All participants were asked to write down the meaning of several traffic signs related to priority rules. They are signs to give priority by an obligatory full stop or by deceleration; they are on the road pavement or on the road side respectively, as shown in Figure 2:
FIGURE 2 Priority sign: give priority by an obligatory stop (a, c), and by deceleration (b, d)

The answers made by the 35 participants are rather peculiar: only 2 persons from the 35 participants could give the correct answers to the four priority signs. More details about the answers are shown in Table 2. Most participants gave wrong answers, or admitted they didn’t know or had never seen them. A few participants only gave ambiguous answers, like deceleration, carefully driving. 22 participants even didn’t believe there is a traffic rule to give priority by a fully stop.

TABLE 2 Answers to recognizing priority sign

<table>
<thead>
<tr>
<th>Location</th>
<th>Sign</th>
<th>Correct Answer</th>
<th>Ambiguous Answer</th>
<th>False Answer</th>
<th>Unknown</th>
<th>Never Seen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road side sign</td>
<td>Give priority by Stop</td>
<td>4</td>
<td>0</td>
<td>9</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Give priority by deceleration</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>On the road pavement</td>
<td>Give priority by Stop</td>
<td>5</td>
<td>1</td>
<td>11</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Give priority by deceleration</td>
<td>4</td>
<td>14</td>
<td>1</td>
<td></td>
<td>1.1.3.</td>
</tr>
</tbody>
</table>

Q3. Do you think some traffic rules are important and others less important? Why?

Most participants stated traffic rules are important, especially the traffic rules related to traffic signals. In participant’s eyes, some rules are irrational, for example too low speed limitation (e.g. 40km/h) on national road
outside an urban area, too long solid lines between lanes to forbid lane changing. If without strict enforcement, these participants told they will ignore these irrational rules.

Q4. What offenses do you often make?

In the focus group sessions, the most often mentioned offenses are illegal parking, crossing solid line to change lane, and speeding on freeways or national roads. Several participants also declared driving over the wrong lane sometimes due to the inappropriately designed signal control. For example, too long queue on the left-turning lane due to too short green time for left turning will make them lose patience and take the through going lane to make a turn left.

Most experienced professional drivers told they were already quite familiar with the local traffic monitoring system and very few offences were recorded in the past year. According to the questionnaire, the average number of offences in the past year is 1.4 times for the professional drivers, and 1.8 times for the other participants. Every participant expressed that traffic monitoring and enforcement of the rules will help drivers to improve their driver behavior.

Ending Questions

The ending question is ‘How to improve driver behavior in China’. The suggestions are concluded as follows:

- Being stricter with driving license examination. More attention should be given to the traffic rules and opinions of driving safety, rather than the driving skills. In the driving license examination, more driving tests on the road with real traffic surroundings should be executed.

- Offering more education about driver behavior and traffic rules through radio broadcast, TV program, Newspaper etc. For example: traffic police enforcing traffic rules on the road by analyzing the traffic accidents cause, traffic rules and responsibility, etc. These measures are expected to increase the knowledge of traffic rules for all of citizens.

- Introducing traffic education system into schools as what have done in western countries for decades, e.g. teaching children at the age of seven the traffic rules for pedestrian and giving a cycling examination at the age of 10.

CONCLUSION AND DISCUSSION

Through the focus group discussions, several specific issues related to Chinese drivers’ attitudes, driving manners and opinions became clear. The driving culture in China is less sophisticated than this in Western countries mainly due to a shorter history of the motorized traffic. The fraction of novice drivers with limited experience is rather large in China. Drivers’ knowledge about traffic rules which they have learned in driver license courses is not reinforced by the daily driving experience, but fades away. Priority rules are not known by most drivers who have to behave carefully because they are not certain about what other drivers will do. In such traffic culture, conflicts can’t be solved according to general traffic rules and the traffic efficiency becomes low in practice. This finding gives an explanation for the conclusion that the saturation flows in Chinese cities are considerably lower than in comparable situation in a Western country, drawn in the previous research (2).
The Chinese participants told that the driving conditions (like congestion, long delays) have an important influence on the way they take decisions. This is partly supported by the finding in (2) that saturation flows depend on the size of intersections and on traffic volumes: larger intersections with more traffic have a higher saturation flow rates.

Lane changing and overtaking have some special characteristics. First of all, lane changing to a left lane is different from a movement to a right lane. Courtesy yielding is more likely to be provided for cars moving to the right lane and not common for lane changing to a left lane. Since many drivers continue to drive on the leftmost lane, overtaking has often to be done on a right lane. If it is done via a left lane, the overtaking car often does not move back to the original lane. The use of the rightmost lane is not as common as the leftmost one. Gap acceptance depends on the traffic situation and in heavy traffic it is often done by gap enforcing.

The personal condition, such as hurry, irritation and impatience, is an important determinant of the driver behavior. Therefore it is necessary in simulation programs to have the possibility to specify different kinds of drivers, such as aggressive or conservative drivers – even though the same driver can switch between these characteristics. The distribution over conservative and aggressive drivers should depend on the traffic situation.

In practice, priority in conflict situation is not always given according to rules, which makes it very difficult to predict how a conflict will be solved. In this case, the delay due to conflicts at intersections and merging sections will in general increase compared with the case that the conflict is solved according to rules.

The results of this research show lots of opportunities for improving driver behavior in Chinese cities. This can be realized by stronger enforcement of the traffic rules, improving driving license examination system, and more education of road users.

This study also shows that simulation models developed in western countries should be adapted to Chinese driving conditions. Especially saturation flows (2), lane changing and priority giving are considerably different. Also the influence of traffic conditions on driver behavior should be considered. The parameters of the car following and lane changing models should be at least calibrated and be modified according to the local traffic situations. Furthermore, some variations in driving style, namely aggressive level, should be introduced.

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REFERENCE


