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Title page

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**Availability, functionality, and use of seat belts in Beijing taxis prior to the  
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Author names and affiliations:

Judy J. **Fleiter**<sup>a</sup>, Liping **Gao**<sup>b</sup>, Chen **Qiu**<sup>b</sup>, Kan **Shi**<sup>b</sup>

<sup>a</sup> Centre for Accident Research and Road Safety-Qld, Queensland University of  
Technology, Kelvin Grove Campus, Brisbane Q 4059 AUSTRALIA  
Email: j.fleiter@qut.edu.au

<sup>b</sup> Center for Social and Organizational Behavior, Management School of Graduate  
University, Chinese Academy of Sciences  
No.7 Building, No.80 Zhongguanchun East Road, Beijing CHINA 100080  
Email: shik@gucas.ac.cn

Corresponding author:

Judy Fleiter Email: j.fleiter@qut.edu.au  
Centre for Accident Research and Road Safety-Qld,  
Queensland University of Technology Carseldine Campus,  
Beams Rd, CARSELDINE Q 4034 AUSTRALIA  
Ph: (+61 7) 3138 4589 Fax: (+61 7) 3138 4907

## Availability, functionality, and use of seat belts in Beijing taxis prior to the 2008 Beijing Olympic Games

### **Abstract**

Use of driver seat belts and availability and functionality of passenger seat belts in a convenience sample of 231 Beijing taxis were examined in the months prior to the 2008 Beijing Olympic Games. Driver and front passenger seat belt use was mandated in China from 2004 to help address the growing public health crisis of road trauma. Results from observations made by in-vehicle passengers revealed that 21.2% of drivers were correctly wearing a belt, approximately half were not, and one third were using the belt in a non-functional way. Over  $\frac{3}{4}$  of this sample of taxi drivers were unrestrained while working. The percentage of functionally available belts was higher for front than rear passengers (88.3% and 22.9% respectively). This low rate of belt availability in rear seats calls into question the preparedness of the fleet to cater for the safety needs of foreign visitors to China, particularly those from countries with high levels of restraint use. Factors influencing the use/misuse of seat belts in China remain largely unexplored. Results of this pilot study support further investigations of barriers to using injury prevention mechanisms such as seat belts in less motorised countries.

**Keywords:** seat belt, China, safety belt, passenger, traffic law enforcement, restraint

### **1 Introduction**

The People's Republic of China is experiencing a rapidly escalating rate of vehicle ownership and usage, a rate that shows no sign of slowing in the immediate future. In the last two decades, vehicle numbers in some of China's largest cities have quadrupled and vehicle ownership continues to spiral upward (Peden et al., 2004). The number of vehicles per 1000 citizens increased from 62.1 in 2003, to 99.7 in 2005 (Zhou et al., 2008). China's citizens are increasingly taking to the streets in motorised vehicles as opposed to the previously ubiquitous bicycle. In the capital, Beijing, an average of 1350 private vehicles per day are newly registered, as are 1240 new drivers (Zhu, 2008). The number of vehicles on the capital's roads was predicted to reach

3.35 million by mid-2008, coinciding with the staging of the 2008 Summer Olympic Games (China Daily, 2008).

With this increase comes, arguably, one of the greatest challenges in road safety planning and management. Unfortunately, with this surge in vehicle ownership, China can anticipate large increases in traffic-related trauma. Fatality estimates range from 7.6/100,000 people in 2005 (Hu, Wen, Baker, & Baker, 2008) to 19/100,000 more recently (World Health Organization, 2008). Increases in fatalities of approximately 92% have been predicted for China in the next two decades (Kopits & Cropper, 2005). Notably, these figures exclude the burden of injury.

The 2003 National People's Congress adopted the Law of the People's Republic of China on Road Traffic Safety, effective May 2004. This provided for compulsory use of safety belts by front seat occupants. The limited research available on seat belt use from a small number of Chinese cities in recent years indicates widely varied compliance rates for drivers of between 7% and 65% (Passmore & Ozanne-Smith, 2006; Routley et al., 2008; Stevenson et al., 2007). The China Seat Belt Intervention was a large-scale project undertaken in the southern city of Guangzhou (with the city of Nanning used as a comparison, non-intervention location) in 2005/6. A public health promotion/education campaign, as well as enhanced traffic police enforcement over 12 months resulted in a significant increase in compliance rates overall to 62% in Guangzhou. The largest increase in compliance was noted amongst taxi drivers, with a significant increase reported from a pre-intervention level of 30% to a post-intervention level of 51% (Stevenson et al., 2007). Another large-scale observational study in Nanjing and Zhoushan between 2005-2007 found almost half the sample of drivers wearing belts (Routley et al., 2008). Smaller observational studies conducted in Beijing indicated wide variation in belt usage. For example, in a study of approximately 2300 drivers on three different road types around the city, the average wearing rate was 63.6% (Zhang, Huang, Roetting, Wang, & Wei, 2006). However, a smaller study of 235 taxi drivers in Chaoyang District, Beijing in 2004 revealed only 7.7% were correctly wearing a belt (Passmore & Ozanne-Smith, 2006).

Most of these studies highlighted the practice of incorrect restraint use, or covert non-compliance, where seat belts are used in a non-functional way (i.e., tampered with) to

give the appearance of compliance, presumably to avoid detection and penalty. This practice is likely to severely limit the safety utility of restraints. One limitation of large-scale observational studies is that observations of belt use and tampering are made from outside a vehicle. This is likely to restrict the specificity of observations, as is the widespread use of dark window tinting on vehicles. Therefore, one aim of the current study was to examine Beijing taxi drivers' seat belt use in the months prior to the 2008 Beijing Olympic Games from inside vehicles.

Leading up to the summer of 2008, Beijing residents were exposed to public education campaigns about road safety. For example, a "Good Driving 2008" campaign, co-sponsored by a major Chinese petroleum company (Sinopec), a television station (BTV9) and a radio traffic station, aimed to encourage drivers to be safe and considerate by rewarding good driving. Drivers were encouraged to voluntarily display a sticker on their car promoting driving habits that comply with traffic regulations. Examples of safe/considerate driving, as well as poor driving were anonymously filmed and aired daily on television, with prizes given to drivers considered compliant and courteous ("Good Driving 2008," 2008). Official safety signage reminding people about seat belt use was also prominent around the city, particularly on the outer ring roads and airport expressway. Additionally, a television commercial broadcast on China Central Television (CCTV) depicted the 2008 Beijing Olympic Games mascots observing road signs and using seat belts when traveling on buses. Together, these initiatives indicate that seat belt usage was encouraged.

Beijing's taxi fleet has undergone substantial changes in recent years. Approximately 30,000 older vehicles were removed in 2005 and another batch was phased out by the end of 2006 to make way for larger, less-polluting models (Guo, 2006; Xinhua News Agency, 2006). Accessible vehicles for people with a disability were introduced in 2008 to assist visitors for the Beijing 2008 Olympic and Paralympic Games (Xinhua News Agency, 2008). Therefore, it seems reasonable to expect that this new fleet of vehicles would be equipped with front and rear seat belts and further, that international visitors, especially those from countries with high restraint compliance rates, would want to use them. Thus, a second aim of the study was to observe seat belt availability and functionality for front and rear passengers in Beijing taxis.

## **2 Method**

Observations of seat belt usage and availability were made in a convenience sample of Beijing taxis over 5 months up to early May 2008 in a large section of districts across the city (e.g., Haidian, Chaoyang, Dongcheng, Fengtai, Xicheng, Chongwen). Passenger journeys were made between the hours of 04.00 and 23.30. There were a considerable number of illegal taxis operating in Beijing. Thus, observations were confined to legitimate vehicles that displayed official signage, used meters and provided receipts, and displayed driver registration information.

On the majority of occasions, two observers were present on each journey, one in the front passenger seat and one in the rear. When only one observer was present (6% of total trips), the front passenger seat was occupied and an observation of seat belts and buckles in the rear of the car was made unobtrusively. Each driver's identification number (required to be displayed on the front dashboard) was recorded unobtrusively during each trip. This provided a means for determining whether drivers had been observed more than once. Only one driver was observed twice during the 5-month period. That duplicate record (containing identical information) was excluded from analysis. Some taxis were fitted with a metal security screen surrounding the driver. This made it difficult to unobtrusively observe the driver's seat belt buckle, and, on occasions, to fasten the front passenger belt. In these instances, cases of obvious non-wearing and obvious covert non-compliance were retained. However, when it was impossible to make an accurate and unobstructed observation because of the screen, cases were excluded (n=10). In total, 231 cases were analysed.

For driver seat belt use, observations were made according to the categories used in the China Seat Belt Intervention study (Stevenson et al., 2007). Drivers were deemed to be correctly wearing a belt if the restraint was worn tightly across their chest and was buckled. Non-use was recorded if there was no shoulder belt visible across the chest and the restraint was visibly not buckled. Non-functional use was recorded when the belt was loosely draped across the driver (whether buckled or unbuckled), spooled out and unable to recoil, positioned behind the back of the driver, positioned only over the left arm of the driver (i.e., the arm closest to the belt recoil mechanism and door), or prevented from recoiling by twisting, knotting, or by the use of items such as clips or rolled pieces of paper. For front seat passenger seat belt availability,

observations were made according to whether the belt and buckle were available and functional. This provided three possible outcomes: available to be worn and functional, not available to be worn (i.e., belt and/or buckle not available, including the buckle being inaccessible because it was on the driver’s side of the metal security screen), and available but not functional (e.g., the belt was loose or spooled out and unable to properly recoil). Similarly, observations of the rear passenger seat belts were made according to belt and buckle availability and functionality resulting in the same three outcomes.

### 3 Results

Of the 231 observations made, 19% of drivers were observed to be wearing the seat belt correctly when passengers entered the vehicle. An additional 2.2% of drivers fastened their seat belt prior to or just as the journey commenced, making a total of 21.2% observed complying with the legislation. Approximately half the drivers (47.2%) were observed not wearing a belt, and approximately one third (31.6%) were observed using the belt in a non-functional way. On one occasion, as the front seat passenger was fitting their belt, the driver commented in English that there was ‘*no need*’ to use the belt.

As seen in Table 1, a greater percentage of seat belts were available and able to be correctly used for front seat than for rear seat passengers (88.3% and 22.9% respectively). Notably, on three-quarters (75.8%) of all journeys, belts and or buckles were not available to rear seat passengers. On the majority of occasions, this was characterised by the absence of a buckle. On a small number of occasions, the buckle was available but the belt was caught firmly (i.e., trapped) behind the rear seat and not able to be used.

Table 1. Front & rear passenger belt availability and functionality in Beijing taxis

	% Available and functional	% Not available for use	% Available but not functional
Front seat	88.3	5.2	6.5
Rear seat	22.9	75.8	1.3

#### 4 Discussion

This pilot study provides descriptive data about the use (by drivers) and availability of front and rear passenger seat belts in a convenience sample of Beijing taxis in the months prior to the 2008 Beijing Olympic Games. To our knowledge, this is the first investigation of belt availability and functionality for front and rear seating positions conducted inside vehicles in China. Seat belt use had previously been observed to be only 7.7% in a similar-sized study of Beijing taxi drivers (Passmore & Ozanne-Smith, 2006). Encouragingly, four years later, our study revealed a considerably higher proportion of observed drivers correctly wearing a seat belt (21.2%). However, almost half the drivers observed (47.2%) were not wearing a restraint, and one third (31.6%) used the restraint in a non-functional way (i.e., covert non-compliance). Thus,  $\frac{3}{4}$  of the taxi drivers were not protected by a seat belt while working. The practice of covert non-compliance is presumably to avoid detection and penalty. This phenomenon has been described elsewhere and was reported as a common practice among professional drivers, particularly taxi drivers, in other Chinese cities (e.g., Routley et al., 2008; Stevenson et al., 2007). Future research should investigate the extent of this practice across various driver and passenger groups.

International research has identified several reasons for belt non-use including: discomfort associated with wearing, forgetting to secure the belt, perceived uselessness of the restraint, carelessness, perceived danger associated with belt use, interference with movement in the vehicle, and lack of established habit (Barss et al., 2008; Shinar, 2007; Simsekoglu & Lajunen, 2008). In China, additional reasons reported include traveling at low speed and traveling short distances, both perceived as negating the need for restraint use (Stevenson et al., 2007). Further research should investigate attitudes and barriers to belt use in the vehicle-using population. This information could be used to inform interventions for drivers and passengers. Additionally, investigations of enforcement-related issues should be considered. This could include barriers to effective enforcement such as the widespread use of dark window tinting on vehicles.

Belt availability and functionality for front and rear taxi passengers was also examined in the current study. Front passenger seats had a much higher percentage (88.3%) of functional belts available than rear seats (22.9%). This result is not surprising, given that the Road Traffic Safety Law originally mandated only the use of front seat restraints. More than  $\frac{3}{4}$  of the observed rear passenger seats had no or non-functional restraints. As such, the preparedness of the taxi fleet to cater for the comfort and safety expectations of international visitors could be questioned, particularly those visitors from countries with high restraint compliance rates. With anticipated tourism growth post-Olympics, this issue is worthy of further attention.

As noted above, our results are encouraging, however, some limitations are evident. The convenience sample used in this study represents but a small proportion of the taxi fleet. As such, the generalisability of our findings to the Beijing fleet, and to other drivers in general is not possible. Additionally, the small sample was collected over a lengthy period (5-months) at a unique time in China's history (pre-Olympic Games). We are unable to estimate the effect of external factors (e.g., the public education campaigns described earlier in this paper) on restraint use during the study. Future research should consider observational studies on a larger scale to generate more reliable restraint use data. Such larger scale studies usually rely on roadside vehicle observations to collect data. While this technique furnishes information about restraint use and belt tampering, in-vehicle observation remains a valuable tool because it can offer more descriptive forms of data than is possible from out-of-vehicle observations. For example, the level of detail described in the current study relating to covert non-wearing techniques (e.g., belt draped across chest but not buckled), and information such as the driver comment about '*no need*' for a passenger seat belt are unlikely to be obtained from roadside observations. Thus, future research should consider a range of complementary data collection methods.

Shinar (2007, pp., pp. 377) reminds us of lessons learned from countries with a longer history of seat belt legislation: "Laws rarely create norms; they typically reflect and reinforce them". Large-scale and sustained public education campaigns have often preceded legislation to help change perceptions about restraint use. Compliance with legislation in China seems likely only if occupants perceive real safety benefits from wearing a seat belt, and/or likely detection and sanction for non-compliance. As

already noted, the legislation does not mandate restraint use by all vehicle occupants. It is hoped that the increasing number of drivers, including those such as taxi drivers who spend large portions of their day exposed to the risks of the road, can look to their legislators and enforcement agencies for protection. Notably, seat belts are a small part of the solution, particularly in countries like China where pedestrians and cyclists represent a large proportion of road trauma (Zhou et al., 2008). As such, while encouraging the correct use of seat belts is important, other measures should continue to be examined in an effort to protect all road users.

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