



Cross-cultural effects on the perception and appraisal of approaching motorcycles at junctions



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ABSTRACT

Both perceptual errors (failing to perceive) and appraisal errors (failing to make a correct judgment about safety) could explain the relatively high number of pulling out at the junctions involving approaching motorcycles in relation to cars. Two experiments were conducted to investigate the effect of exposure to motorcycles on these types of errors by comparing drivers from Malaysia where motorcycles are very common with drivers from the UK where motorcycles are rare. Experiment 1 investigated drivers' ability to perceive approaching vehicles (car or motorcycle) located at different distances (near, intermediate and far) on UK and Malaysian roads. There was no difference between Malaysian and UK drivers in overall ability to perceive the approaching vehicles but Malaysian drivers were relatively good at perceiving motorcycles at further distances. Experiment 2 investigated drivers' judgments about whether or not it was safe to pull out on the same roads and found that Malaysian drivers were more likely to judge it was safe to pull out as compared to UK drivers. Findings suggest that high exposure to motorcycles may reduce vehicle effects on perception for Malaysian drivers. However they may make more risky appraisals about safety of pulling out, which might contribute to the high accident and fatality rates in Malaysia.

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1. Introduction

One of the most common types of accidents which involve motorcycles is the failure of another road user to give way to an approaching motorcycle on the main carriageway when emerging from a side road (Clark, Ward, Bartle, & Truman, 2004). This mistake has been attributed to the 'Look But Fail to See' error (Brown, 2002) whereby the driver reports having looked into the road but not having seen the motorcycle, and has been documented in several countries previously (de Lapparent, 2006; Haworth, Mulvihill, Wallace, Symmons, & Regan, 2005; Hurt, Ouellet, & Thom, 1981). Crundall, Humphrey, and Clarke (2008) propose that at least three key behaviours are required for a driver to avoid collision with an approaching motorcycle at a junction. First, drivers have to correctly look in the direction of the approaching vehicle before pulling out. Second, drivers must be able to process and recognise the oncoming vehicle. Successful execution of these first two behaviours would result in perception of the oncoming vehicle and should avert the 'Look but fail to see' accident. However, having perceived

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the approaching vehicle, drivers must also appraise, that is, make a judgment about the safety of pulling out in front of it (Crundall et al., 2008). Failure in any of these three behaviours could lead to a collision.

Crundall et al. (2008) conducted two experiments to investigate the contribution of failures to perceive (to look at and process oncoming vehicles) and failures to appraise (make an appropriate judgment about safety of pulling out) to give-way collisions involving motorcycles with other road users. In the first experiment, a series of images of T-junctions were shown to participants for 250 ms each. The photographs were taken from the point of view of a UK driver (left-side driving) who had reached a junction with the intention to turn right across the contraflow lane, and was looking to the right in anticipation of oncoming traffic. Participants were required to respond whether they saw an approaching vehicle, which could be either a car or a motorcycle, located at either a near, intermediate or far distance from the viewer. These target vehicles occurred on 50% of the trials with the remaining trials presenting empty carriageways. It was found that approaching cars were spotted more often than motorcycles and this effect was primarily due to poor performance for motorcycles presented at the far distance and to some extent at the intermediate distance. Despite the acknowledged caveats regarding the use of brief, static stimuli, the difference observed between cars and motorcycles suggests that perceptual failures may indeed contribute to the relatively large number of give-way accidents involving motorcycles as opposed to cars. Crundall et al. (2008) went on to conduct a second experiment which aimed to determine whether there were differences in drivers' judgments about whether it was safe to pull out in front of cars and motorcycles. The same images as used in the previous experiment were this time shown for 5000 ms and participants were required to judge whether it was safe to pull out. There were no differences in participants' judgments of safety of pulling out in front of different types of approaching vehicle suggesting that given enough time to perceive the vehicle, drivers' judgments were consistent across vehicle types. Taken together, Crundall et al.'s (2008) experiments suggest that failures in perception may be more important than failures of appraisal in explaining these give-way collisions.

One factor which may mediate these perceptual failures is expectations. In the UK, where Crundall et al.'s study was conducted, motorcycles make up less than 1% of all traffic (DETR, 2000) which may result in a low expectation of their presence. In an experimental study it may however quickly become apparent to participants that motorcycles may occur frequently. Despite this conscious overriding of expectation, the lack of exposure to motorcycles may prevent perceptual learning and discrimination of their front profiles. Crundall et al. (2008) speculate that drivers who have greater exposure to motorcycles in daily driving may accordingly have a lower threshold for motorcycle detection. Consistent with this, it has been found that dual drivers are less likely to be responsible for motorcycle crashes (Magazzu, Comelli, & Marinoni, 2006). Brooks and Guppy (1990) also found that drivers who have family members or close friends who ride motorcycles, and had ridden pillion themselves, are less likely to be involved in accidents with motorcycles, and showed better observation of motorcycles than drivers who did not. Therefore drivers who are frequently exposed to motorcycles in their daily driving may be less impaired in perceiving motorcycles in comparison to cars.

To investigate this possibility we used the methodology developed by Crundall et al. (2008) to directly compare perceptual performance of drivers from the UK, a country with a very low frequency of motorcycles, with drivers from Malaysia, where motorcycles constitute the highest number of registered vehicles. There are over 9 million registered motorcycles on the road in Malaysia (Roslan, Sarani, Hashim, & Saniran, 2011) compared with around 1.2 million in the UK (DfT, 2014a,b). Despite these differences both Malaysia and the UK have a left-lane driving system, allowing a direct translation of Crundall et al.'s methodology between the countries. Drivers viewed the same images of UK roads used in Crundall et al.'s (2008) study along with a second set of images taken on Malaysian roads. If Malaysian drivers have a lower threshold for detection of motorcycles we might expect them to show less discrepancy in their ability to detect motorcycles compared with cars than their UK counterparts, and possibly even enhanced motorcycle detection performance. As both groups of drivers viewed roads from both countries the experiment also enabled us to determine whether environmental familiarity plays a role in perceptual performance i.e. whether drivers are better at detecting motorcycles when they appear in a familiar context (their own country) compared to an unfamiliar context (the other country). This would be indicated by an interaction between the driver nationality and the road origin.

2. Experiment 1: How do Malaysian and UK drivers perceive approaching vehicles at junctions?

2.1. Methods

2.1.1. Participants

In total 33 participants were recruited who were all students studying for degrees at either the University of Nottingham UK or Malaysian campuses. This comprised 17 Malaysian (9 males and 8 females) and 16 British (8 males and 8 females) drivers. The average age of Malaysian drivers was 20.12 years (s.d. = 1.58) ranging from 18 to 23 years old and they reported an average of 1.97 years of active driving experience since getting their driving license in Malaysia (s.d. = 1.59 years). The average age of British drivers was 21.00 years (s.d. = 1.10 years) ranging from 19 to 23 years old and they reported an average of 2.75 years of active driving experience since getting their driving license in the UK (s.d. = 1.34 years). Independent-samples *t*-tests revealed that there was no difference in the years of active driving experience, $t(31) = 1.53$, $p > 0.05$, and no difference in terms of age between Malaysian and British drivers, $t(31) = 1.86$, $p > 0.05$. All reported normal or corrected-to-normal vision and were not colour blind. All participants reported no experience of riding a motorcycle.

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