



Allocation of attention in familiar and unfamiliar traffic scenarios



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ARTICLE INFO

Article history:

Received 12 April 2017

Received in revised form 9 January 2018

Accepted 4 March 2018

Keywords:

Attention
Habit
Driving
Expectancy
Road accidents
Tourism

ABSTRACT

Increased travel worldwide has led to an escalation of road traffic accidents, particularly among tourists driving in unfamiliar, opposite traffic flow driving scenarios. Ability to allocate attention to driving-relevant information and regions is predicted to be the main cause of tourist accidents, with a lack of attention directed to areas of space that are inhibited in familiar traffic conventions but relevant in overseas driving. This study investigated the influence of habit and expectancy on driver behaviour and allocation of attention in familiar (left-hand traffic; LHT) and unfamiliar (right-hand traffic; RHT) contexts. Twenty-eight drivers from the UK were presented with video clips of driving taken in the UK and in Poland and asked to judge whether it was safe to enter a roundabout in each clip. Half were given information about differences in LHT and RHT situations prior to the task. Judgement performance was not influenced by this information, however accuracy was higher for LHT and the RHT task was rated more difficult, supporting the notion that driving in unfamiliar surroundings is more effortful. In LHT both groups made more fixations to the right side of each roundabout, however in RHT, whilst the control group allocated attention in the same way, the intervention group made significantly more fixations to the left. Pre-drive preparatory information can therefore increase attention to the most relevant areas of space in unfamiliar driving contexts. This has implications for drive tourism and it is suggested that such information is made more explicit to drivers.

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1. Introduction

Transport is a key aspect of a traveller's spatial mobility, either as a means of travel between origin and destination, travel within the destination itself, or multi-destination travel (Masiero & Zoltan, 2013). However, whilst *drive tourism* has its benefits, driving in unfamiliar environments can lead to increases in road traffic accidents (RTAs). The quantification of such RTA fatalities is difficult to estimate, as often no data for tourists exist (Ball & Machin, 2006), and where consular or local data has been collected the extent of the problem is often minimised by the exclusion of non-fatal incidents, underreporting, or inaccuracies in the police and coroner reports (McDonald, Davie, & Langley, 2009). Despite this, the International Travel and Health report from the World Health Organisation (WHO, 2012, p. 51) states that "road traffic collisions are the most frequent cause of death among travellers".

The Commission for Global Road Safety (2010) distinguishes between *destination* road safety risks (safety of local infrastructure, fatality rates, and levels of safety enforcement) and *tourist-specific* road safety risks, such as unfamiliarity,

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disorientation, distraction, and fatigue. The focus of the current work is unfamiliarity and habitual driving which are frequently cited as risk factors for tourists driving in traffic contexts that are different from that of their home country (Wilks & Pendergast, 2011). This is particularly the case when they are confronted with unfamiliar driving rules such as when driving from a *left-hand traffic system* (LHT; whereby individuals drive on the left-hand side of the road, approaching traffic comes from the right, and usually the driver is seated in the right-hand side of the vehicle) to a *right-hand traffic system* (RHT; vehicles drive on the right, oncoming traffic approaches from the left, and the driver is usually seated on the left). For instance, in Oceania, which operates a LHT system, international visitors face a higher RTA risk than residents (22.0 and 10.8 per 100,000, respectively), and they account for 13% of road fatalities and 8% of injuries (Catchpole, Pratt, & Pyta, 2014; Watson et al., 2004). Crucially, tourists from RHT systems (around 65% of all visitors), i.e. with a different traffic convention, are significantly overrepresented in these figures (Dobson, Smith, McFadden, Walker, & Hollingworth, 2004; Leggat & Wilks, 2009; Wilks & Pendergast, 2011). Consistent findings have also been reported in RHT countries such as Greece where pleasure-driving tourists from LHT are 2.5 times more likely to be involved in RTAs than RHT visitors (Petridou, Askitopoulou, Vourvahakis, Skalkidis, & Trichopoulos, 1997).

A survey commissioned by the Foreign and Commonwealth Office (FCO, 2008) reveals the extent of the difficulties associated with travelling from one traffic convention to another with 31% of UK residents admitting to driving on the wrong side of the road overseas, 10% driving the wrong way around a roundabout, and 54% reporting problems crossing the road as a pedestrian. Petridou et al. (1997, p. 691) refer to these types of errors as resulting from “a lack of reflexes conditioned on reverse traffic direction”, indicating that limited experience with the opposite traffic convention means drivers are unable to complete the task effectively. A recent study by Wu (2015) supports this by exploring the safety issues and coping techniques of Chinese drivers (RHT) travelling to Australia (LHT). Unfamiliar driving rules were rated as one of five safety concerns and individuals noted that they had to be more attentive and cautious when travelling in LHT to avoid error.

The findings of Wu (2015) reflect the importance of allocating attention in unfamiliar environments. Despite the common assumption in tourism literature that once a holiday destination is reached, foreign drivers lose their common sense and change into ‘*tourons*’ (half tourist, half moron; Walker & Page, 2004), research suggests that many RTAs involving tourists can be explained due to attentional factors involved in adapting to the new traffic environment (and from the familiar traffic environment). Selective attention guides resources to relevant and informative areas and stimuli within the environment and is influenced by both top-down and bottom-up factors (e.g., Folk, Remington, & Johnston, 1992; Schneider & Shiffrin, 1977; Theeuwes, 1993). Trick, Enns, Mills, and Vavrik (2004) have proposed a framework that describes the interaction between these factors and task demands. Exogenous shifts of attention are characterised by automatic *reflexes* (bottom-up capture of attention by sudden onsets) and controlled *exploration* (allocation of attention to salient information in the environment). Endogenous shifts of attention include *habits* (automatic allocation of attention to relevant information and locations) and *deliberation* (conscious processing of information).

Whilst deliberation is effortful and occurs in unfamiliar situations, such as when an individual is learning to drive, habits are developed over time due to repeated exposure to similar situations. Habitual selection requires fewer cognitive resources and therefore reduces the cognitive workload involved in the driving task; however it can also lead to errors (Trick et al., 2004). Specifically, because a habit is automatic it may be applied in a situation in which it is not relevant. This is termed ‘habit lag’ (Mannell & Duthie, 1975) and can be related to ‘lapses of attention’ whereby an insufficient amount of attention is devoted to the task resulting in the misapplication of routine rules or actions to inappropriate situations (Reason, 1990). This is evidenced by the work of Shrira and Noguchi (2016) who examined all motor vehicle fatalities in the United States between 1990 and 2010 on the basis of whether the individual lived in a rural or urban setting, whether they were driving in a rural or urban setting at the time of death, and whether this setting was in the home county or a different county. There was a greater risk of RTAs on rural roads than urban roads, however this risk increased significantly for those who lived in urban areas and had travelled to rural (unfamiliar) areas. Shrira and Noguchi (2016) argue that different driving environments have unique risks and drivers in unfamiliar settings may not adapt to these new risks.

The strength of a habit is modulated by practice and habitual responses can be overcome by increasing control over attentional selection. However, this requires more cognitive resources because the habitual response must be inhibited and attention must instead be deliberately guided on the basis of the task goals (Hofmann, Schmeichel, & Baddeley, 2012). It is argued that this in turn increases a driver’s subjective mental workload, an account supported by Wu, Zaho, Lin, and Lee (2013) who found that experienced international drivers report higher mental workload and make more wrong turn errors when they navigate intersections in unfamiliar road environments compared to familiar road environments.

One way to measure the habitual allocation of attention in practiced tasks is to investigate a driver’s visual search strategy. This is illustrated in a study by Shinoda, Hayhoe, and Shrivastava (2001) in which participants were asked to drive along a simulated route while their eye movements were recorded. Part way through the drive a “no-parking” sign (located at an intersection or on a straight stretch of road) changed to a “stop” sign and findings showed that when the sign was located at an intersection participants made more fixations to it and were more likely to detect the change compared to when it was located on a straight road. The effect was more pronounced when participants were instructed to adhere to traffic regulations. This shows that drivers allocate attention based on task demand, knowledge of the driving environment, and expectation. Drivers assign attentional weights (importance) to relevant objects and locations and with practice can apply these automatically when in a similar situation. The findings of Labbett and Langham (2006) support this as when experienced drivers (more practiced) watched video clips of drivers approaching a T-junction they fixated the most informative areas in the scene, whereas novice drivers (less practiced) did not constrain their search in the same way. It is therefore argued

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