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Mimicry and stop sign compliance ☆

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ABSTRACT

Many road-users fail to comply with the stop sign rule, potentially increasing the chance of accidents at junctions. Within a social-cognitive framework, we investigated whether the behaviour of traffic in front influences road-user's stop sign compliance, focussing in particular on whether the notion of mimicry is useful in explaining rates of stop sign dissent. In the absence of conflicting traffic, road-users were significantly (p = .012, Φ = 0.083) less likely to stop if traffic in front did not stop (of n = 535, 11% stopped), compared to when there was no traffic in front (of n = 369, 16.8% stopped). However, there was no evidence of mimicry when traffic in front did stop (19.3% stopped), compared to when no vehicle was in front (16.8% stopped) (p = .720, Φ = 0.033). If road-users mimic negative behaviours rather than positive ones, over time it is likely that the rate of non-compliance will increase. The findings and directions for future research are discussed.

1. Introduction

Road traffic rules state how road-users should behave to maintain order and safety on the roads. Compliance is encouraged by the legal system, which may impose pecuniary fines, loss of licence, or imprisonment on those found failing to comply (Ross, 1960). Typically, however, many road-users do not comply with traffic rules. For example, road-users drive at speeds higher than the legal limit (Tillyer & Engel, 2012) or in un-roadworthy cars (Hallsworth, Tolley, & Black, 1998), under the influence of alcohol (Bergen, Shults, Beck, & Qayad, 2012) or illegal drugs (Drummer et al., 2003), race on public roads (Leal & Watson, 2011), or use mobile telephones for voice or text calls whilst driving (Walsh, White, Hyde, & Watson, 2008).

In most countries, arguably one of the simplest and clearest road traffic rules is that, at stop signs all road-users must "stop regardless of whether conflicting traffic is present or approaching the intersection" (Retting, Weinstein, & Solomon, 2003, p. 485). Having first stopped, drivers must then "evaluate the proximity of on-coming traffic and yield accordingly…", before proceeding further (Lebbon, Austin, Houten, & Malenfant, 2007, p. 28). However, many road-users contravene this rule and "fail to stop or, after stopping, proceed without looking for traffic on the major road", thus increasing the chance of an accident (Houten & Retting, 2001p.185). Indeed, approximately 673,000 motor vehicle crashes occurred at stop signs in the US in 2011, of which 2433 involved fatality and 208,000 involved injury (NHTSA, 2013).

Two early studies of road-users at stop signs reported compliance rates of 76% (Allport, 1934) and 50% (Hummel & Schmeidler, 1955). However, studies such as these, in which the presence of conflicting traffic was not controlled, do not test compliance with the stop sign rule *per se*, as road-users may have had a "double incentive to stop: the possibility of a collision and the presence of the stop sign" (Allport, 1934, p.148). Consistent with this observation, lower rates of stop sign

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compliance have been observed in the absence of conflicting cross traffic; for example, 23% (DeVeauuse, Kim, Peek-Asa, McArthur, & Kraus, 1999); 15% (Feest, 1968), 24% and 12% (McKelvie, 1986; McKelvie, 1987), less than 5% (Lebbon et al., 2007), and 45% (McKelvie & Schamer, 2010).

Although we located no studies that specifically investigated why stop sign compliance is so low, a review of pertinent literature suggests four areas that may help to focus general investigations of driver behaviour at stop signs. First, is behavioural, where it is suggested that road-users may "learn through their own experience that it is possible to break the rules without encountering aversive consequences" (Aberg, 1998, p. 213). For example, in terms of operant conditioning, failing to stop would be positively reinforced by savings in time. However, in NZ, what we suspect to be a relatively low rate of prosecutions—New Zealand Police issued 18,522 infringement offences for failure to stop in 2012 (NZP, personal communication)—suggests that drivers will learn that the risk of positive punishment (being fined or having an accident) is low. Second, is cognitive, in which "rather than obeying the law, drivers seem to evaluate the risk of violation and then to act accordingly" (McKelvie, 1987, p. 685). For example, drivers may process information by contrasting savings in time against the likelihood of accident (of 772 crashes at stop signs in NZ in 2011, 3 involved fatalities and 30 involved serious injury [NZTA, personal communication]) or prosecution, then decide that stop sign dissent is the rational choice. Third, is motivational, where instrumental reasons (e.g., avoidance of danger) may affect traffic rule compliance (Yagil, 1998). For example, at accident 'black-spots', which are reported by the New Zealand Transport Authority (NZTA), drivers may feel more motivated to comply with stop sign rules than at junctions where they have neither heard of nor witnessed accidents. Fourth, Rothengatter (1990) suggested that as road-users are constantly interacting with each other before deciding how to act—similar to how people interact in various other situations—a social/cognitive framework may be useful for understanding driver behaviour.

Consistent with Rothengatter's (1990) thesis, we sought to explore whether drivers approaching stop signs mimic the behaviour of the drivers directly to their front. We believe this to be particularly important, as if rates of stop sign compliance dip below 50%, there will be fewer positive exemplars (i.e., those who stop at stop signs) than negative exemplars (i.e., stop sign dissenters) available to mimic. Thus, if drivers mimic the behaviour of those in front of them, or tend to favour negative exemplars over positive ones, it could lead over time to further decreases in stop sign compliance.

Behavioural mimicry, copying the behaviour of others, has been observed to occur in a wide range of settings. For example, when shopping (Argo, Dahl, & Manchanda, 2005), choosing food (Herman, Roth, & Polivy, 2003), postures and gestures (Chartrand & Bargh, 1999), facial expressions (Blairy, Herrera, & Hess, 1999), accents (Cappella & Planalp, 1981), stairs versus escalators (Webb, Eves, & Smith, 2011), mood (Neumann & Strack, 2000), behaviour of workers (Glomb & Liao, 2003), prosocial behaviour (Van Baaren, Holland, Kawakami, & Van Knippenberg, 2004) and emotions (Hatfield, Cacioppo, & Rapson, 1994).

According to Chartrand and Bargh (1999), "merely perceiving an action performed by another can lead one to perform that action" (p.905), a process that is entirely passive and unconscious, and "a routine consequence of normal cognitive functioning" (Johnston, 2002, p. 19). However, Lakin and Chartrand (2003) demonstrated that there might also be a motivational component, as under some conditions motivational factors (even unconscious ones) appear to affect rates of mimicry. For example, it has been suggested that mimicry changes depending on the social context, which may reflect a Machiavellian strategy for enhancing one's social standing (Wang & Hamilton, 2012), and also with the amount of gaze between participants (Wang & Hamilton, 2014).

In the current study, we investigate whether the behaviour of traffic in front[1] influences road-users about to negotiate stop signs. Traffic in front may comply with stop sign rules (positive exemplar) or fail to comply by proceeding through the junction without stopping (negative exemplar). Consistent with prior research on mimicry (e.g., Chartrand & Bargh, 1999), stop sign behaviour (e.g., McKelvie, 1987) and driver behaviour generally (e.g., Rothengatter, 1990), two hypotheses were tested on drivers negotiating a stop sign in the absence of obviously conflicting traffic: (1) when a vehicle directly in front does not stop at the stop sign, compared to when no traffic is in front, drivers following will be less likely to stop; and (2) when a vehicle directly in front stops at a stop sign, compared to when no traffic is in front, drivers following will be more likely to stop.

2. Methods

2.1. Participants

Participants were road-users (i.e., drivers of any motorised vehicles including motorcyclists), who were observed negotiating a stop sign junction at the busiest exit from a major university campus (there were three other exits from the same campus) in New Zealand.

2.2. Setting, materials and procedure

Logistical and temporal constraints determined that we could only observe drivers at stop signs in the nearby locale. An informal survey of departmental colleagues enabled us to identify seven stop sign locations where we could observe

[1] Following traffic is potentially another source of influence on road-users. However, as many road-users do not regularly use their rear view mirrors (Pastor et al., 2006), they may be unaware of following traffic. Observations of the effect of following traffic on stop sign compliance would therefore potentially be subject to unacceptably high levels of measurement error. For this reason, we do not include the effect of following traffic in our investigation.