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Influences on anger in German urban cyclists

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ABSTRACT

Previous research shows that anger and aggression among road users lead to maladjusted driving and a higher risk of accidents. Especially cyclists as vulnerable road users have a high risk of being injured if they are involved in accidents. This paper examines reasons for cycling anger in two studies. The first study aimed at identifying anger provoking events. Seventy-three cyclists were invited to discuss anger provoking events in a focus group setting. These events were rated regarding their anger intensity, clustered within focus groups, and aggregated across all groups. The first study revealed 208 unique cycling anger provoking events of varying anger intensity that were summarized in six clusters. The second study aimed at validating these anger provoking events, the ratings, and the clusters. Here, 129 participants were asked to complete a four-time point diary study (over the course of ten days), in which they registered all anger provoking events that they experienced while cycling. The results of this study validated most of the anger provoking events of the first study. Both studies show that most anger provoking events are related to conflicts between cyclists with other road users like car drivers and pedestrians. Moreover, conflicts with car drivers seem to cause stronger anger among cyclists than conflicts with other cyclists or pedestrians. Implications for further research and the planning of road infrastructure are discussed.

1. Introduction

1.1. Anger in road traffic

Anger is understood as a personal tendency that biases people to blame others for blocked goals in uncertain situations. The cognitive mechanisms of how anger influences information processing and the relationship of anger and aggressive behaviour have been examined extensively in emotion research. In the appraisal tendencies framework (e.g., Lerner & Keltner, 2000), six central appraisal themes (certainty, pleasantness, attentional activity, anticipated effort, control, and responsibility) differentiate between emotions. Anger is appraised as "[...] predictable, under human control and brought about by others (Lerner & Keltner, 2000; p. 497)". Studies have shown that experiencing anger while driving a car is predicted by other peoples' goal-blocking behaviours. This relationship is strongest if drivers (a) perceive the other person to be responsible for his or her behaviour, (b) think that others are in control of their behaviour, and (c) believe that the others act with aggressive intention (Beisswingert, Zhang, Goetz, Fang, & Fischbacher, 2015; Mesken, Hagenzieker, Rothengatter, &

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de Waard, 2007). The relationship of other peoples' goal-blocking behaviours and driving anger has been shown in self-report studies (Britt & Garrity, 2006; O'Brien, Shaw, Watson, & Lennon, 2012; Roidl, Siebert, Oehl, & Höger, 2013) and in driving simulator studies with various appraisal structures depending on the driving situation (Roidl, Frehse, & Höger, 2014).

Anger as perceptual theme primes the misconceptions of situations, aggressive thoughts, scripts, and associated expressive motor behaviours. In the traffic context, these expressive motor behaviours are associated with riskier driving behaviours and hence a higher risk of accidents (Baumann & DeSteno, 2012; Jeon, Walker, & Yim, 2014; Lennon & Watson, 2015; Stephens & Groeger, 2006, 2009, 2011; Stephens & Ohtsuka, 2014; Stephens, Hill, & Sullman, 2016). Individuals with higher tendencies to appraise traffic situations with anger were found to drive faster and to exceed speed limits more often (Mesken et al., 2007). However, the aggressive expression of anger depends on a person's attributional style. For example, drivers who tend to attribute other peoples' behaviours to hostility are more likely to express aggressive behaviours. Those who attribute others' behaviour to their insufficient skills show less aggressive behaviour. Finally, drivers who give others the benefit of doubt and interpret their behaviour as an honest mistake are least aggressive in their reaction (Lennon & Watson, 2015). Attributing the anger-provoking event to a stable factor in the offending driver has been identified to be a unique predictor of anger and expressed aggressions on the road (Britt & Garrity, 2006). Deffenbacher, Stephens, and Sullman (2016) also found anger sensitive drivers to appraise unclear situations in a more hostile way and to react more aggressive to them than non-anger sensitive drivers.

Differences in anger expression do not only exist between people, but also within people. Zhang, Chan, and Zhang (2015), for example, found that aggressive driver behaviour can be predicted by goal-blocking behaviours that were incongruent with the driver's goal of timely arrival (e.g., traffic congestions). In contrast, behaviours of others that were incongruent with the driver's goal of safe arrival (e.g., sudden braking of the car in front) led to less aberrant driving behaviour. Lennon, Watson, Arlidge, and Fraine (2011) demonstrated the actor-observer bias for aggressive driving. Drivers attribute their own behaviour to be caused by the situation and not by their personality. In contrast, the behaviour of others is rather attributed to stable personality traits than to the driving situation making it easy for them to become angry. Finally, group stereotypes also influence the attributions of anger. Males' driving behaviours, for example, are more often attributed to hostile acts as it is the case for female drivers (Yagil, 2001). Stereotypes regarding the skill level of a possible recipient of aggression were also found to influence drivers' aggressive responses. Stephens and Groeger (2014) showed that drivers reacted more aggressively if slow cars in front of them were labelled to be learner drivers than non-learners. In addition, Rowden et al. (2016) revealed that car drivers who are also motorcyclists report differing levels of anger and aggressive behaviours depending on the vehicle they used, i.e., when motorcycling, lower levels were reported.

1.2. Cycling anger

Bicycles make up about 11% of Germany's traffic volume. They are the fastest growing sector in transportation in Germany and the German federal government aims at increasing the share of bicycles up to 15% by 2020 (Bundesministerium für Verkehr und digitale Infrastruktur, 2011).

At the same time 12% of all German road fatalities and 21% of all severely injured people in traffic were cyclists in 2014 (DESTATIS, 2015). In urban traffic, every fourth person killed and every third person seriously injured is a cyclist (Schreck, 2016). Young (10–15 yrs.) and adolescent (15–18 yrs.) cyclists have a proportionally higher risk of being injured in cycling accidents than older groups, whereas older cyclists (65+ yrs.) have a higher risk of being killed (von Below, 2016). About three quarter of all police-reported cyclists' accidents in Germany involved one or more motor vehicles; another 8% involved other cyclists. Interactions with motorized vehicles are therefore the riskiest traffic situations for cyclists (see also Bíl, Bílová, & Müller, 2010). Most cyclists that are killed or seriously injured are involved in collisions at junctions (see The Royal Society for the Prevention of Accidents, 2015 for international data and Schreck, 2016 for a German statistic). Miscommunication and incorrect expectations about each other's behaviour seem to be important factors for crashes between cars and bicycles (Chaurand & Delhomme, 2013; Räsänen & Summala, 1998).

Cycling differs from driving a car in many ways. The handling, the effort undertaken to move, and all interactions with other traffic participants are more direct for cyclists. They also have a higher proportional risk of being severely injured in collisions than motorized vehicle drivers because they do not have a chassis to protect their body (Chaurand & Delhomme, 2013). Successful interactions with others, especially with motorized road users, are therefore extremely important for cyclist health.

Cyclists often find themselves in situations with mixed traffic. This includes situations with motorized vehicles and cyclists on the same road as well as non-motorized road users and cyclists on sidewalks (Paschalidis, et al., 2016). Conflicts arise when there is high uncertainty with respect to other road users' traffic behaviours (Paschalidis et al., 2016). In addition, conflicts also arise if other road users experience cyclists as an unnecessary hindrance (Fyhri, Bjørnskau, & Sørensen, 2012), which is often the case when motorized traffic sharing the same road as cyclists. In addition, cyclists may be experienced as a threat by pedestrians when sharing a sidewalk. Therefore, cyclists have a higher chance of encountering situations that may elicit conflicts and anger than any other traffic participants.

In contrast to vehicle drivers, the roles of cyclists' emotions and personalities in traffic have just begun to attract scientific attention. Kaplan and Prato (2016) as well as Nixon (2014) qualitatively investigated perceptions, cognitions, emotions, and overt behaviour of cyclists and other road users towards cyclists. While Nixon (2014) directly interviewed road users of differing modality uses, Kaplan and Prato (2016) investigated comments on online newspaper reports of cyclists' crashes