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More screen operation than calling: The results of observing cyclists' behaviour while using mobile phones

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ABSTRACT

Operating a mobile telephone while riding a bicycle is fairly common practice in the Netherlands, yet it is unknown if this use is stable or increasing. As such, whether the prevalence of mobile phone use while cycling has changed over the past five years was studied via on-road observation. In addition the impact of mobile phone use on lateral position, i.e. distance from the front wheel to the curb, was also examined to see if it compared to the results seen in previous experimental studies.

Bicyclists were observed at six different locations and their behaviour was scored. It was found that compared to five years ago the use of mobile phones while cycling has changed, not in frequency, but in how cyclists were operating their phones. As found in 2008, three percent of the bicyclists were observed to be operating a phone, but a shift from calling (0.7% of cyclists observed) to operating (typing, texting, 2.3% of cyclists) was found. In 2008 nearly the complete opposite usage was observed: 2.2% of the cyclists were calling and 0.6% was texting. Another finding was that effects on lateral position were similar to those seen in experimental studies in that cyclists using a phone maintained a cycling position which was further away from the curb. It was also found that when at an intersection, cyclist's operating their phone made less head movements to the right than cyclists who were just cycling. This shift from calling to screen operation, when combined with the finding related to reduced head movements at intersections, is worrying and potentially dangerous.

1. Introduction

There is extensive research on the effects of using mobile phones while driving a car and in general this research shows a deterioration in vehicle control (e.g. Caird et al., 2008). As such, in most countries legislation has been introduced so that only hands free use of mobile phones is allowed, if mobile phone use is allowed at all (e.g. Ibrahim et al., 2011; Waddell and Wiener, 2014). In addition to the effects on car drivers, prevalence of operating a mobile phone while riding a motorcycle has also been recently researched; Pérez-Núñez et al. (2014) observed that 0.64% operated a phone while riding a motorcycle. Again in most countries, including Mexico, operation of mobile phones while riding is illegal (Pérez-Núñez et al., 2014). When it comes to riding a bicycle the situation is different, and differs between countries. In Japan, for example, it is not permissible to operate a phone while bicycling (Ichikawa and Nakahara, 2008), while in Germany and Belgium mobile phone use while cycling is only allowed with a hands free set (see Mwakalonge et al., 2014). In the Netherlands, even though such use when driving a car is forbidden, it is not illegal to operate a phone while cycling, although the general rule that traffic safety may not be endangered still applies. Indeed, phone use while cycling is relatively common in the Netherlands. For example, in 2008 in the city of Groningen 2.2% of cyclists observed during an on-road study were seen to be talking on their mobile phone, while 0.6% appeared to be operating the keyboard in a fashion that could suggest texting behaviour (De Waard et al., 2010). Similarly, in 2012 Terzano (2013) observed 1360 bicyclists in the city of The Hague and found that 3.5% were operating a mobile phone. This slightly higher (+0.7%) percentage of mobile phone users in The Hague compared with Groningen may reflect an increase in phone user over the four years' time difference, or may reflect differences in the habits of cyclists between the two cities. Furthermore, in an internet survey of Dutch cyclists, Goldenbeld et al. (2012) found that 17% of the cyclists reported using their phone on every trip they make, while 55% said that they occasionally made phone calls while cycling. Information on the use of mobile phones while riding a bicycle in countries other than

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Table 1
The three main comparisons (2 × 3 locations) made and measurements taken, see also Fig. 1 for an illustration of the locations. A plus sign indicates that this measure was assessed in the comparison and a minus sign indicates that it was not measured. Number of hours, time of day and exact location where data were recorded at each location are shown at the right hand side.

Comparison	Variables assessed			Hours recorded	Recording times	Recording locations in Groningen
(Locations)	Lateral position	Gender	Gaze/head movements			
[1] Road: bicycle lane vs. sharing (no indication)	+	+	–	11	12:00–17:00	St Walburgsstraat–Kreupelstraat
[2] Separate bicycle path: one vs. two way traffic	+	+	–	15	11:00–14:00 and 16:00–19:00	Stationsweg
[3] Road vs. intersection	–	+	+	11	8:00–9:00 and 16:00–18:00	Kerklaan vs. crossing Kerklaan-Kruissingel

the Netherlands is unfortunately scarce, but Yang et al. (2012) reported that the use of a mobile phone while riding an electrical bicycle was only 0.43% of the cyclists observed in Suzhou, China. Also, in a survey completed in the USA 9% of the 2580 respondents indicated that they made use of electronic equipment during every ride they made (Schroeder and Wilbur, 2013). Unfortunately no division in type of electronic device operated was made, an electronic device could thus be a mobile phone, an mp3 music player, or some kind of GPS or electronic exercise tracker.

In terms of examining the impact of mobile phone use while cycling accident statistics could be examined. However, statistics on bicycle accidents in which mobile phone use has played a role are likely to be biased, as admitting phone use while cycling may be avoided even when there is no formal penalty for it. In a survey completed by 1142 cyclists treated at the emergency care department of a selection of hospitals in the Netherlands (De Waard et al., 2010) only 0.3% stated they had been talking on their mobile telephone at the time of the accident, while 0.2% said they had been texting. Furthermore, in the 10 min preceding the accidents 2.5% of the cyclists reported that they had been operating their mobile phone. These post-accident reports are different from the results of the aforementioned internet survey (Goldenbeld et al., 2012) where respondents reported that during 10% of the reported non-injury accidents and 9% of the reported injury accidents that they were using a portable electronic device. However, these latter results again include listening to music with a portable device. Also, both studies are questionnaire studies, which have response bias limitations and may suffer from social desirability biases. As such, the actual prevalence of mobile phone use associated with accidents is more likely to be higher than lower.

As an alternative to looking at accident data, a series of experimental studies have been carried out to examine the impact of mobile phone use on bicyclist's behaviour (De Waard et al., 2010, 2011, 2014). These experiments found effects of phone use on lane control, lane position, speed, and object detection performance in peripheral field tests. Specifically, in terms of lane position, when operating a mobile phone, in particular when texting, and even more so when using a touch screen telephone (De Waard et al., 2014), users increased the distance they kept from the curb compared to conditions in which they did not use a phone. This could be risky in situations where cyclists shift position in the direction of other larger vehicles that they may be sharing the road with. Although the studies were performed outdoors on participant's own bicycles, these are results that were obtained in experimental studies that were completed under controlled conditions on a remote, isolated quiet bicycle path. As such, an unanswered question is whether the effects on lane position found in the experiments could also be found in real, busy, and sometimes mixed traffic, as behavioural response may vary depending on the road environment. In the Netherlands there are separate bicycle paths with one or two way bicycle traffic, there are bicycle lanes that are part of the main road only separated by a white line and indicated by red coloured asphalt, and there are locations where cyclists share the main road without an indicated lane. All of these different road environments may produce different behaviours in cyclists and other road users.

In addition to lane position, the looking behaviour of cyclists also seems to be affected by secondary tasks. In her observation study in The Hague, Terzano (2013) rated the behaviour of cyclists who were using mobile phones more frequently as "unsafe" than the behaviour of bicyclists who were not performing a secondary task. The classification of behaviour as safe/unsafe however, was subjective, even though a few examples of unsafe behaviour were given. The author also states "we do not know whether those bicyclists who were performing a secondary task were distracted by that task or, if distracted, to what degree they were distracted" (Terzano, 2013, p. 89). Nevertheless, the study does give an indication of the frequency of phone use and perceived effects on safety. With regard to looking behaviour, in the experimental studies performed on the isolated bicycle path (De Waard et al., 2010, 2011, 2014) objects positioned in the periphery were more frequently missed when cyclists operated a mobile phone. However, that task was an artificial secondary task and may not be a good indication of looking behaviour and detection performance in real life.

In the present study the use of mobile phones was again observed via an on-road study to see if usage in the same city, Groningen, has changed since 2008 (De Waard et al., 2010). As touch screen devices with multiple functions have become more common since 2008, another aim was to observe how people operate their phone in daily cycling and if this had changed since

Table 2
The infrastructural characteristics of the locations where bicyclists' behaviour was compared, see Fig. 1 for photos of the locations.

Location	Road or lane width	Characteristics
Bicycle lane	1.3 m	Red coloured
Road 1 (preceding bicycle lane)	7.8 m	Grey asphalt
One way bicycle path	2.2 m	–
Two way bicycle path	3.0 m (per direction: 1.5 m)	Small centre line
Road 2 (preceding intersection)	6.0 m	–
Before/after intersection	6.0 m	Give way to left and right