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Do German drivers use their smartphones safely?—Not really!

Mark Vollrath[a,*], Anja Katharina Huemer[a], Carolin Teller[a], Anastasia Likhacheva[b], Jana Fricke[a]

[a] Technische Universität Braunschweig, Institut für Psychologie, Ingenieur- und Verkehrspsychologie, Gaußstraße 23, 38106 Braunschweig, Germany
[b] Humboldt-Universität zu Berlin, Institut für Psychologie, Ingenieurpsychologie & Kognitive Ergonomie, Rudower Chaussee 18, 12489 Berlin, Germany

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ABSTRACT

Research in the laboratory as well as in naturalistic driving studies has shown that texting while driving seems to be the most dangerous driver distraction. However, there is still some discussion about the extent to which drivers adapt their behavior to the traffic situation. Accordingly, they might use their phones only in easy driving situations but refrain from doing so when driving becomes more demanding. For Germany, no reliable data on these topics could be found although overall smartphone use has also increased exponentially in this country. As observational studies have proven to be an effective means to gather these data, such a study was done observing 11,837 drivers in three big German cities (Braunschweig, Hannover, Berlin) during daytime. An alarmingly high rate of texting while driving was found (4.5%) as compared to other international studies. This was even more frequent than the use of handheld (2.2%) and hands-free (1.7%) phones combined. Thus, there seems to be a special problem in Germany with texting which should be further examined as this activity is highly distracting. Finally, there was some indication that drivers adapt their secondary task activities to the requirements of the driving task (e.g. somewhat less texting when moving than when stationary at a red traffic light). However, these adaptations were not very strong. Thus, drivers seem to underestimate the dangers due to distraction. This could be a starting point for countermeasures which increase this awareness of danger.

1. Background

Distraction seems to become one of the major causes of accidents. For example, Singh (2015) reported for the US that recognition errors (driver's inattention, internal and external distractions, and inadequate surveillance) were responsible for 41% of the crashes examined. In Austria, driver distraction is recorded as a causing factor in vehicle crashes by the police. Accordingly, in Austria in 2014 distraction was the most common cause for traffic crashes, being responsible for 38% of all crashes (VVO, 2015).

One of the major sources of distraction seems to be the use of smartphones while driving. While only about 30% of the German households had at least one smartphone in 2000, the percentage has risen to 90% in 2012 (Statistisches Bundesamt, 2013). This increase may also result in an increased use while driving. For example, in the Naturalistic Driving Study SHRP2, Victor et al. (2014) found drivers to be clearly attentive to the road only in about 30% of their analyzed driving episodes, but clearly distracted in more than 50% of these episodes. The most common, identified types of distraction were passenger related (about 10%), portable electronics (about 10%) and texting (about 8%).

There is still a discussion about which kinds of distractions are really dangerous and increase the risk of an accident. While the first case-control studies seemed to indicate that talking on the phone increases accident risk (Redelmeier and Tibshirani, 1997), more recent studies even find a decrease in accident risk while phoning (Young, 2015). Methodological errors in the early risk studies may have led to these first estimations of an increased risk while phoning (Young, 2015). The first analyses of rear-end accidents in the SHRP2 study also showed that the risk of a rear-end accident while phoning is only 0.1 of that when driving without distraction (Victor et al., 2014). However, in a newer analysis from the same database (the SHRP2 data), Dingus et al. (2016) compared the relative contribution of driver distractions, driver errors and other driver impairments in all crashes recorded during the study with episodes in that drivers were clearly unimpaired (so-called model driving). In this comparison, they found that talking on the cell phone increased the accident risk by 2.2.

The major cause for these differences in results may be that in the car following scenario drivers on the phone may have been

* Corresponding author.
E-mail address: Mark.vollrath@tu-braunschweig.de (M. Vollrath).

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driving slower with larger headways. Moreover, drivers who phone tend to focus on the road ahead while phoning (Victor et al., 2014) and do not look so much around as they do otherwise. Thus, they are very well able to rapidly detect if the car in front stops. In contrast, the scenarios investigated by Dingus et al. (2016) were more complex and far more diverse. Additionally, the use of model driving as the baseline comparison may have influenced the estimation of the accident risk.

Overall, these results show that a secondary task like phoning increases accident risk for some situations but may even decrease the risk in other situations if drivers adapt their behavior and drive more cautiously. Thus, the situations in which drivers engage in secondary tasks should be examined as well as the effect of the secondary tasks themselves. This can be done relatively easily by means of traffic observations. In one of the first studies by Johnson et al. (2004) digital photographs were used. When examining about 40,000 photographs of drivers passing through a New Jersey turnpike, the most frequent activities were using the cell phone (1.39%), interactions with passengers (0.56%) and smoking (0.39%). Drinking accounted for 0.22%, eating for 0.08%. However, as photographs only capture a very short moment in time, other studies have used human observers at the side of the road (e.g., in the US, g. McCartt et al., 2010; in the UK, Broughton and Buckle, 2007; in New Zealand, Dury et al., 2012; in Australia Young et al., 2010; in Spain, Prat et al., 2014). The results from these and other observation studies show that this is quite an effective method to gather a large number of observations and to estimate the frequency of different, observable distractions. Moreover, quite a large number of possible influencing factors can be observed regarding the driver and the circumstances of the trip. This can be used to better understand which drivers engage in secondary tasks under which circumstances. Finally, as only very basic characteristics of the driver like age and sex are recorded, the data are anonymous and cannot be related to any specific driver.

For example, a large number of studies found higher phone use in young drivers as compared to middle aged drivers (e.g. Dury et al., 2012; Horberry et al., 2001; Young et al., 2010; Gras et al., 2012). The presence of passengers seems to reduce phone use (e.g., Astrain et al., 2003; Glasbrenner, 2005; Johnson et al., 2004; NHTSA, 2009; Wenners et al., 2013). The time of day implying different kinds of trips may also influence phone use. For example, in Europe, Sullman (2012) found more eating and cell phone use in the morning, but more texting in the afternoon.

This information gathered by traffic observations is also quite useful to develop countermeasures for those distractions that are most frequent. The information about different groups of drivers and the circumstances under which secondary tasks occur is also very interesting in order to define relevant target groups and situations.

However, for Germany there is still hardly any information about the frequency of distraction while driving, especially caused by smartphones. In Germany, phoning is only allowed using a hands-free device. It is forbidden to have a phone in your hand and to operate it in any way (§23 StVO; German Traffic Law). Since 2005, the number of drivers caught using the phone while driving has increased from about 290,000 to about 450,000 (KBA, 2012). However, it is impossible to say in which manner this corresponds to the percentage of the drivers using the phone. Compared to about 50,000,000 cars in Germany, this figure seems very small.

In 2009, a pilot study was conducted interviewing 289 drivers at parking lots at highways and in town, including cars and trucks (Huemer and Vollrath, 2011). It was found that 34% of them had tuned their radio during the last half hour of the trip, about 20% had made a phone call, 3% had made an input with their navigation system and 1% had written a text message.

More recent data on secondary tasks while driving were gathered by some surveys in German speaking countries. In these surveys, the frequency of secondary tasks while driving was estimated by asking participants how often they did specific tasks while driving. Answers could be given on a five point scale from “never” to “always”. Accordingly, the data give only a very rough estimation about the willingness to engage in different types of tasks. For example, Kubitzki (2011) questioned 600 drivers from Germany, Austria and Swiss about 40 specific tasks done while driving and split data for drivers who had a crash reported in the insurance companies’ files and those who had no crash. He found the most frequently reported activity to be listening to the radio (91% of drivers who had an accident, 82% of those who had not), followed by talking on the phone hands-free after having been called (88%/76%). In all tasks examined, those drivers who have had crashes in the previous three years resulted in higher proportions reporting the task (Kubitzki, 2011; p. 17). Similar estimates come from Goodyear Dunlop Germany (2013), AachenMünchener Versicherung AG (2013) and Ford-Werke GmbH (2014). All these studies from Germany show that a large percentage of drivers are willing to engage in secondary tasks at least at some occasions. However, these percentages do not tell how many trips are done with secondary tasks and in which situations. Accordingly, the results cannot be compared to those gathered by driver observations.

Thus, although the data from other countries indicate that distraction especially by smartphones may be an increasing problem in traffic, respective observational data are missing for Germany. The first aim of the study presented here was to gather this information. Different methods to this aim were examined beforehand. Naturalistic driving studies require an enormous effort but usually give only information about a limited number of drivers. Conducting interviews with drivers gives only quite imprecise information (e.g., “I do this sometimes”). Even interviews directly after the trip as in Huemer and Vollrath (2011) may suffer from the inability to precisely recollect the involvement in secondary task and especially their duration. Moreover, some drivers may not want to tell their activities truthfully. Thus, an observation study was conducted in three large cities in Germany (Braunschweig, Hannover and the capital Berlin).

Following the discussion above, one should not only measure how many drivers engage in smartphone use, but also in which situations they do so. This is the reason for the question in the title of this paper: Do German drivers use their smartphones safely? In order to address this question, the observations were done at situations where using a smartphone might be less dangerous (e.g., when waiting at a red traffic light) and others where drivers might refrain from using their phone because of the complexity of the driving situation (e.g., in dense traffic on larger roads in town).

To summarize, the study has two aims:

(1) To estimate the frequency of different distracting activities while driving in Germany.
(2) To examine whether drivers adapt their behavior to the traffic situation and to what extent the behavior depends on driver characteristics.

2. Method

2.1. Locations and timing

As the observations require that the observer stands quite close to the passing cars and has sufficient time to observe what the driver is doing, it was decided to focus the study on traffic within towns. As the observations are more effective when more