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Using the Smartphone at the Wheel

Flying blind with consequences



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Distraction is currently one of the most common causes of road traffic accidents. Conventional mobile phones have long been an integral part of our everyday lives, but by now, everyday life without multifunctional smartphones is no longer conceivable for most people. In addition to “merely” making calls and writing text messages, the options offered by mobile communications allow a multitude of further applications as well as potential distractions in traffic. However, distraction while driving is particularly dangerous. In 2017, distraction and inattention were presumed to be the main causes of accidents for 35 % of car occupants involved in accidents and 34 % of those killed (Statistik Austria 2017). The results of the studies conducted by the Austrian Road Safety Board [Kuratorium für Verkehrssicherheit, KFV] confirm the risk of distraction as it was observed in 50 % of the observations of drivers. This applies in particular to young drivers. 50 % of them accept calls while driving and 38 % do so without using a hands-free car kit. Another problem is that other mobile phone or smartphone activities, such as reading text messages (33 %), writing (25 %) or using other messenger services (25 %), are very popular while driving, especially among young drivers. It has been shown that distraction due to mobile phones or smartphones greatly increases the risk of traffic accidents. The driving simulator study conducted by the Austrian Road Safety Board has also demonstrated that reading and typing on mobile phones or smartphones leads to significantly slower reactions to critical events. There is frequently a lack of awareness of the dangers of distraction in traffic, which has led to an increased risk potential in recent years. The projection of a previous representative survey of 1,000 Austrian motorists aged 17 and over, commissioned by the Austrian Road Safety Board and carried out in 2014 by Marketmind with a focus on the mobile phone or smartphone at the wheel, showed that in Austria around 200,000 text messages are sent daily from the car. A targeted comprehensive package of measures is therefore needed.

1. INTRODUCTION

Making a return call, occasionally checking incoming mail, casually typing a text message or entering the destination address in the navigation app: in contemporary society, mobile phones or smartphones are an almost indispensable medium for young

and old. In traffic, however, this leads to an increasing problem affecting all road users. Of course, several things are often done at the same time. Listening to loud music, eating, talking and other activities can also have a distracting effect in traffic. In addition to driving, distraction can also

increase the risk of an accident while cycling or walking. More than a third of all traffic accidents in Austria involving personal injury are caused by distraction and inattention. In the period from 2013 to 2017, however, an average of 26,101 car occupants per year were involved in accidents, 35 % of them because of the presumed main cause of the accident: distraction and inattention. 29 % of all car occupants lose their lives every year as a result of distraction and inattention (Statistik Austria 2013 to 2017). Internationally, distraction is assumed to be the cause of 5 to 25 % of all traffic accidents (SWOV 2013). The international estimates refer exclusively to distraction. In Austria, distraction in road accidents is statistically recorded in the official traffic accident statistics along with another cause under the main accident cause category: “distraction and inattention”. This also includes all distracting activities at the wheel, such as using a mobile phone or smartphone. In the following, the causes of accidents, distraction and inattention, will be briefly summarised under the term of distraction.

2. DISTRACTION IN TRAFFIC

2.1 The myth of multitasking

While driving, many road users often feel a sense of routine along with the need for additional activity. People tend to want to perform several tasks at the same time, even in traffic. This is referred to as multitasking. However, performing a task requires a certain degree of concentration. Attention must be focused on what is important for the task at hand. The processing capacity of the brain is limited, but especially in traffic a lot of traffic-relevant information has to be processed continuously. Of the many millions of bits of information sent to our brain every second, we can probably only process up to 40 bits

per second (Eagleman/Sejnowski 2000). If, for example, 25 bits are used to use a mobile phone or smartphone, only 15 bits remain for processing visual information. Our brain is therefore only partially able to pay close attention to different stimuli at the same time (Johns Hopkins University 2005). An example of this is that we do not consciously perceive some things in such situations, although we obviously see them – so multitasking in traffic does not work without consequences. If road users carry out different activities at the same time, important traffic-relevant information is lost because the more an activity requires processing capacity, the less capacity is available for other tasks (Paridon/Kaufmann 2010).

2.2 Digital age – smartphone

The issue of distracted driving is often focused on the use of mobile phones or smartphones. In recent years, the Austrian legislature has reacted to this: in 2016, under the 32nd amendment to the Motor Vehicles Act [Kraftfahrzeuggesetz-Novelle], prohibited any use of mobile phones, except for making calls using a hands-free car kit and for navigation devices, provided that they are fitted inside the vehicle. Making phone calls without a hands-free car kit has been prohibited in Austria since 1999 (Section 102(3) of the Motor Vehicles Act, introduced with the Austrian Federal Law Gazette I No. 1998/146). The use of mobile phones and smartphones at the wheel is considered particularly dangerous. The risk of accidents is about five times higher while making a call without a hands-free car kit, and 23 times higher while reading or writing text messages than without a distraction (Olson et al. 2009).

Most of the population owns a smartphone that has far more than just phone and messaging functions (MindTake Research 2015). Although the percentage of

distraction and inattention in accidents is known, there is no information in the accident statistics about the details of the specific type of distraction. The rapid spread of new technologies, among other things, means that it can be assumed that the use of mobile phones or smartphones accounts for a considerable proportion. Young people in particular not only use new technologies more frequently than older people, they also structure their everyday lives by using them. The Austrian Road Safety Board has conducted research to learn more about the actual extent of distraction caused by mobile phones, smartphones and other sources.

3. STUDY DESIGN

A combination of different data collection methods is recommended for research on distracted driving (Bortz/Döring 2007). Therefore, observations were combined with a naturalistic driving video analysis and interviews. This was supplemented by a driving simulator study conducted jointly with the Belgian Road Safety Institute (BRSI), now the VIAS Institute, to analyse driving behaviour and eye movements using eye tracking.

3.1 Observation: video analysis of naturalistic driving

The observation was made by viewing video recordings from a naturalistic driving study (Pommer et al. 2016). The authentic driving behaviour of car drivers was observed over a period of several months using measuring devices and video cameras. A total of 9,366 video sequences were examined in detail with regard to distracting activities, such as the use of mobile phones or smartphones while driving, and the different types of distraction were noted.

3.2 Survey

A representative telephone survey of the Austrian population aged 15 and over was conducted in order to determine the perceived behaviour of individuals and others in traffic and their subjective view of danger. The survey comprised a total of 657 drivers. In addition, 256 participants in the Austrian multi-phase training (MEP), which mostly comprises young adults up to the age of 22, could be surveyed in writing using a questionnaire specifically prepared for this purpose, in order to identify particularities among new drivers. They were asked about their subjective views on the dangers of distraction and the frequency of different behaviours while driving. In addition, questions were asked about the reasons for using a mobile phone or smartphone and about the most dangerous personal behaviour while driving.

3.3 Driving behaviour analysis – driving simulator

The driving simulator study examined the driving behaviour of 63 car drivers in combination with different types of distractions within a vehicle. This was based on a study by Boets et al. (Boets et al. 2015), which deals with distraction due to text messages. The scenarios of the driving simulator were adapted and enhanced for the study in Austria.

The test subjects completed a test track with slight curves in good daylight visibility and through a local area without traffic lights. They were confronted with six different test conditions, such as 1) reading an SMS/text message, 2) writing an SMS/text message, 3) making a phone call while holding a mobile phone or smartphone to the ear, 4) making a phone call with a hands-free car kit, 5) eating and 6) drinking; as well as a control condition (no additional activity). The reaction to critical situations, speed, lane behaviour and

eye movements of the test subjects were recorded during driving. The study used a fixed mounted driving simulator with automatic gear change and corresponding software that records all relevant driving parameters. A special eye tracking system was also used to register eye movements.

4. FINDINGS

The projection of a previous representative survey of 1,000 Austrian motorists aged 17 and over, conducted in 2014 by Marketmind on behalf of the Austrian Road Safety Board with a focus on mobile phone and smartphone use at the wheel, showed the following: In Austria, a total of around 200,000 text messages are sent from cars on a daily basis while driving. If it is assumed that drivers take their eyes off the road for about 5 seconds per text message, a distance of 5.1 million kilometres – corresponding to 128 times the length of the equator – is covered “blindly” at an average speed of 50 km/h. It is not only the drivers’ visual but also their cognitive and motor functions that are strongly influenced. Young car drivers in particular often communicate via text messages at the wheel. However, other activities, such as eating, drinking, talking or using the navigation system, which are not related to the use of mobile phones or smartphones, can also seriously reduce attention.

4.1 Observation of car drivers

The observation of car drivers’ behaviour by the video analysis of naturalistic driving showed that more than every second video sequence examined (53 %) revealed incidental activities or possible indicators of distraction. The most frequent observations were drivers looking out of the window (15 %) and in the vehicle (12 %), followed by the activity of talking or moving lips (8 %). Making phone calls using a hands-free car kit was found in 5 % of

Source: Austrian Road Safety Board 2017

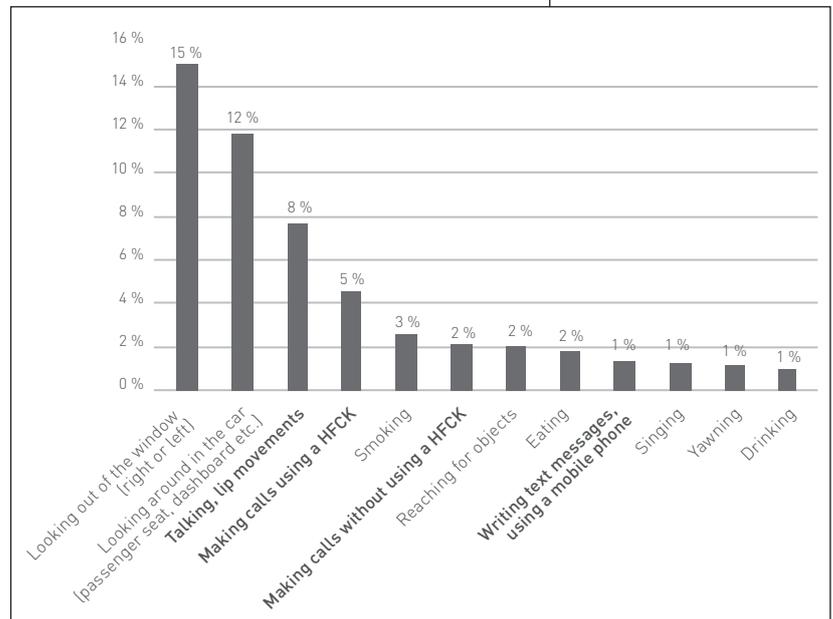


Figure 1: Observed activities or indicators for distractions in the context of the video analysis of naturalistic driving, n=9,366 video sequences

the video sequences examined and making phone calls without a hands-free car kit in 2 % of the video sequences examined (see Figure 1). The type of distraction could not always be clearly identified because only the driver is visible on the camera image of the video sequence and there are no sound recordings. Moving lips, for example, indicate speaking with fellow passengers, but can also mean that the driver is on

Source: Austrian Road Safety Board 2017

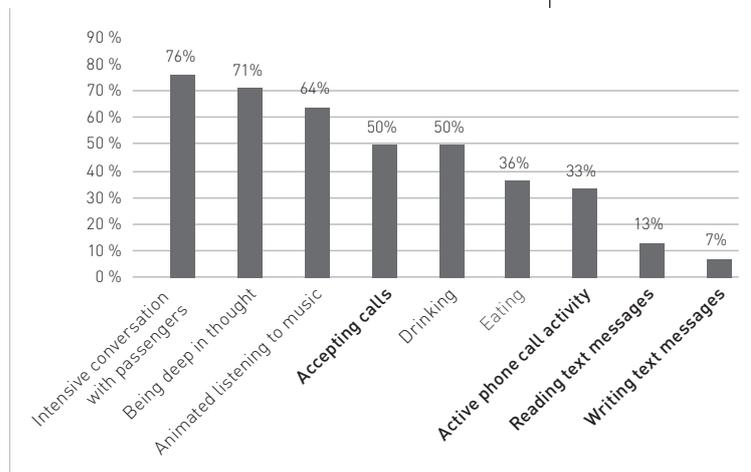


Figure 2: Activities while driving a car according to car drivers surveyed, n=657

the phone or talking to himself or herself. Lip movements were attributed to making a phone call using a hands-free car kit if they only occurred after explicitly visible dialling; however, it may be assumed that a large proportion of observed lip movements, which did not involve explicitly observed dialling, may also be attributed to making phone calls and that this therefore represents one of the most significant distractions while driving.

4.2 Survey of car drivers

The results of the survey show that, according to the information provided by respondents, intensive conversations with fellow passengers are among the most frequent distractions in traffic (76 % do this at least occasionally), followed by day-dreaming or being deep in thought (71 %) and animated listening to music (64 %) (see Figure 2, page 33). However, half of the respondents (50 %) said they would accept calls at least occasionally while driving, and a third (33 %) even did so without a hands-free car kit. One third of respondents (33 %) call someone at least occasionally while driving, with 19 % even

do so without a hands-free car kit. In addition, almost every eighth car driver surveyed (13 %) stated that they read text messages at least occasionally while driving and that 7 % even write messages.

Regarding the different age groups of the car drivers surveyed, however, it was found that almost all distracting activities are carried out more frequently by younger drivers (aged 17 to 25) (see Figure 3). Destination entry in navigation systems in particular is very often carried out as an activity, closely followed by making phone calls without a hands-free car kit and even reading text messages, emails and other messages. Younger car drivers read and write significantly more frequently while driving than older age groups. As far as mobile phones or smartphones are concerned, it became apparent that only 26- to 39-year-olds make more frequent calls with/without using a hands-free car kit.

The results of the survey involving new drivers showed that, with regard to self-observed behaviour while driving a car, distractions related to mobile phones or smartphones at the wheel are of great importance. Regarding the use of mobile

Source: Austrian Road Safety Board 2017

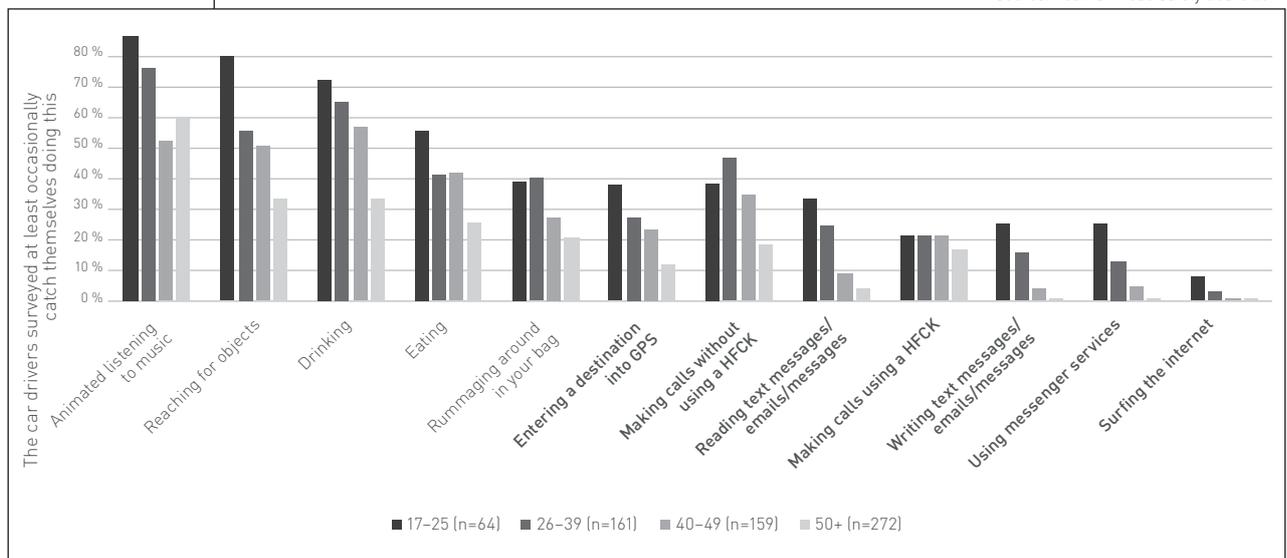


Figure 3: Activities while driving a car according to car drivers surveyed by age groups, n=657

phones or smartphones, almost a third of the respondents (30 %) stated that they make calls “frequently” or “very frequently” while driving (by picking up the phone or actively calling someone). Around a quarter of respondents (24 %) said they read incoming messages on their mobile phones “frequently” or “very frequently” while driving; about one in seven new drivers (14 %) even writes messages regularly while driving. Among the reasons for using a mobile phone or smartphone while driving, new drivers most frequently reported habit (23 %), waiting for calls (16 %), boredom (11 %) and checking messages (6 %).

5. THE CONSEQUENCES OF DISTRACTION

Distractions caused by the use of mobile phones or smartphones result in insufficient abilities to receive or process traffic-relevant information in a timely way. The following effects can be summarised in the case of being distracted at the wheel on the basis of research findings, supplemented by a further representative survey (Kubitzki 2011; Pilgerstorfer et al. 2017):

- ▶ reduction of the usable field of view by approx. 14 %,
- ▶ view fixed on the middle of the road,
- ▶ reduced awareness of orientation and safety, reduced use of mirrors,
- ▶ reduced control of speed,
- ▶ shorter distance between own vehicle and oncoming traffic when turning left,
- ▶ inadequate speed reduction before bends or traffic lights,
- ▶ overlooking red light and traffic signs,
- ▶ insufficient safety distance.

5.1 Consequences of distraction in the driving simulator

The aforementioned findings have shown that making a call at the wheel and writing or reading text messages present an

Source: Austrian Road Safety Board 2017

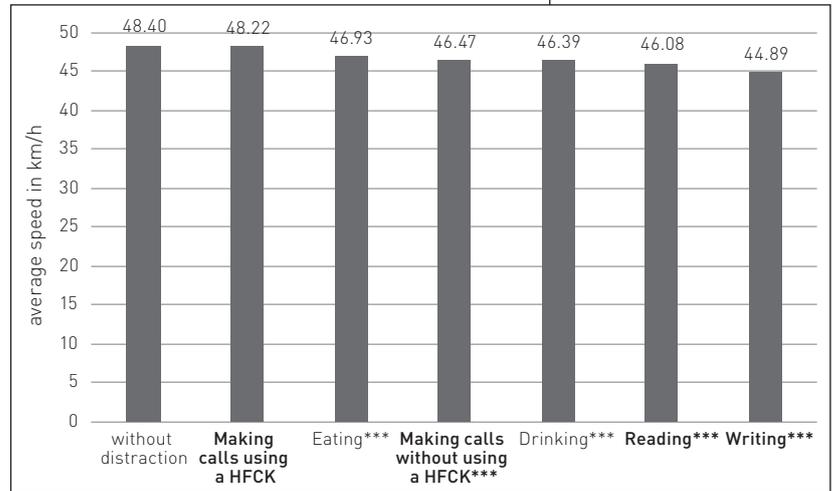


Figure 4: Average speed driven according to test condition, n=63, *** <0.000

increased risk of accidents. The major findings of the driving simulator study (Pilgerstorfer/Boets 2017; Pilgerstorfer/Salamon 2016) are explained below. The findings show different consequences or effects of the test conditions mentioned in the study design (3.3 Driving behaviour analysis – driving simulator) on the speed, lane behaviour, reaction time and observation behaviour of the test subjects (Boets et al. 2015). With regard to the differences in average speed between the control condition (without distraction) and the respective test conditions, reading or

Source: Austrian Road Safety Board 2017

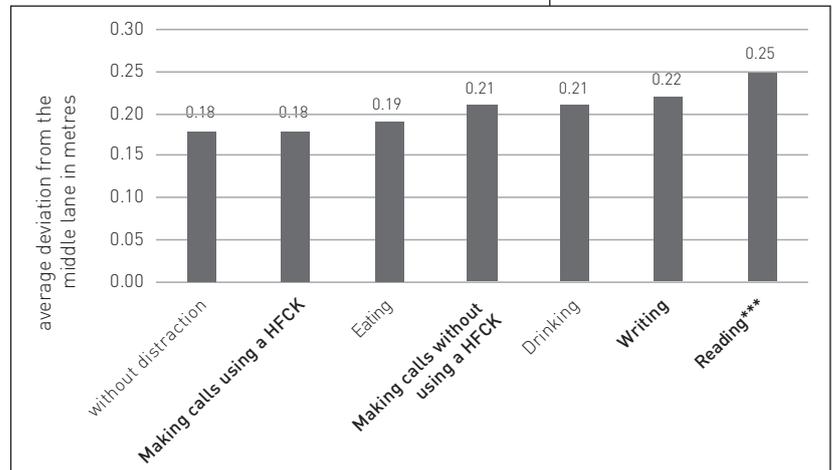


Figure 5: Deviations from middle lane according to test condition, n=63, *** <0.000

Source: Austrian Road Safety Board 2017

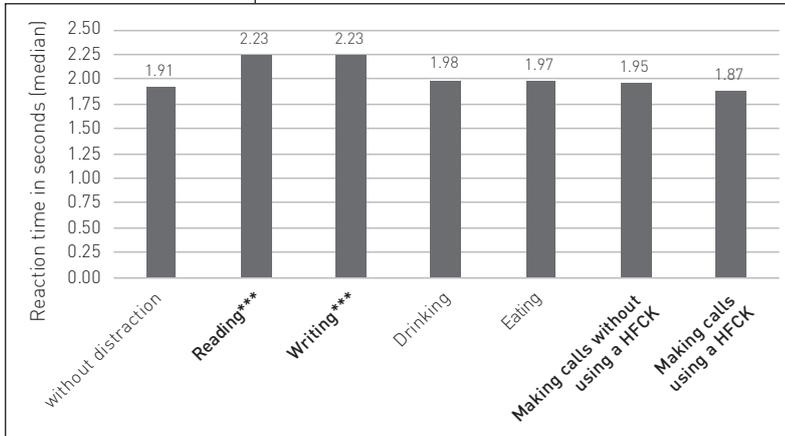


Figure 6: Average reaction times according to test condition, n=63, * <0.000**

writing text messages on a mobile phone or smartphone showed the greatest reductions in driving speed (see Figure 4, page 35). The average speed of 46.08 km/h for reading text messages and 44.89 km/h for typing text messages was far lower than without distraction (48.40 km/h). A reduction in speed was also found for making calls without a hands-free car kit – in contrast to making calls with one. The driving simulator also showed that significant deviations from the middle lane (0.25 metres compared with 0.18 metres) occur when reading text messages (see Figure 5, page 35).

Reaction times during reading and writing text messages increased sharply from 1.91 seconds to 2.23 seconds each (see Figure 6). These activities also showed a very wide dispersion, i.e. clear differences, between the study participants. It should also be noted that reaction times were only included in the evaluation if they were actually measured. The lack of reactions resulting in an accident is not taken into account here.

It was found that reading or writing text messages as well as making telephone calls without a hands-free car kit, in particular, significantly reduced the average attention paid to traffic-relevant areas (see Figure 7). If the average percentage of the attention paid to traffic-relevant areas in the field of vision without distraction was 91 %, it was almost halved to 52 % and 49 % respectively when reading and writing text messages.

5.2 Subjective perception of distraction

Questions about the potential consequences of distracting activities were also asked in the car drivers' survey. To summarize, the use of mobile phones and smartphones was assessed as the most dangerous.

Source: Austrian Road Safety Board 2017

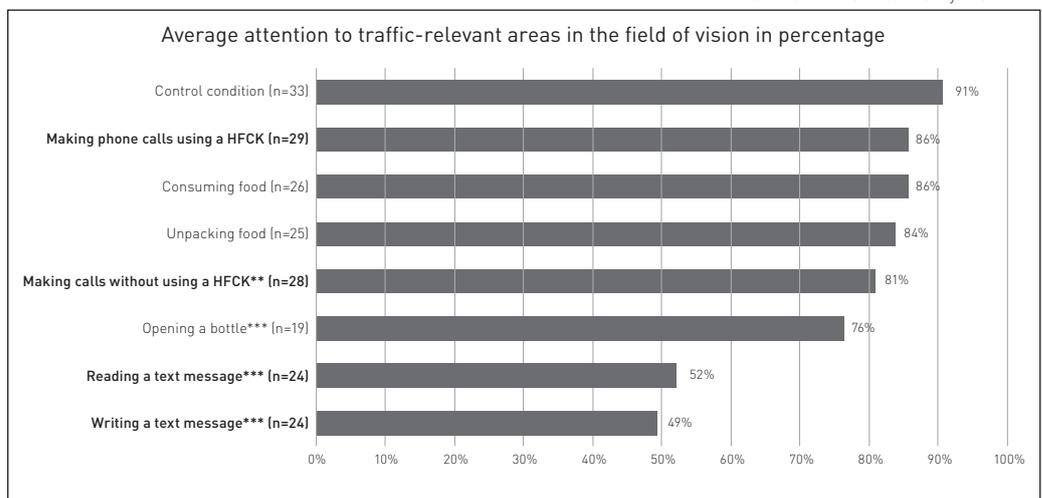


Figure 7: Percentage of average attention paid to traffic-relevant areas in the field of vision according to test conditions, n=63, * <0.000**

Source: Austrian Road Safety Board 2017

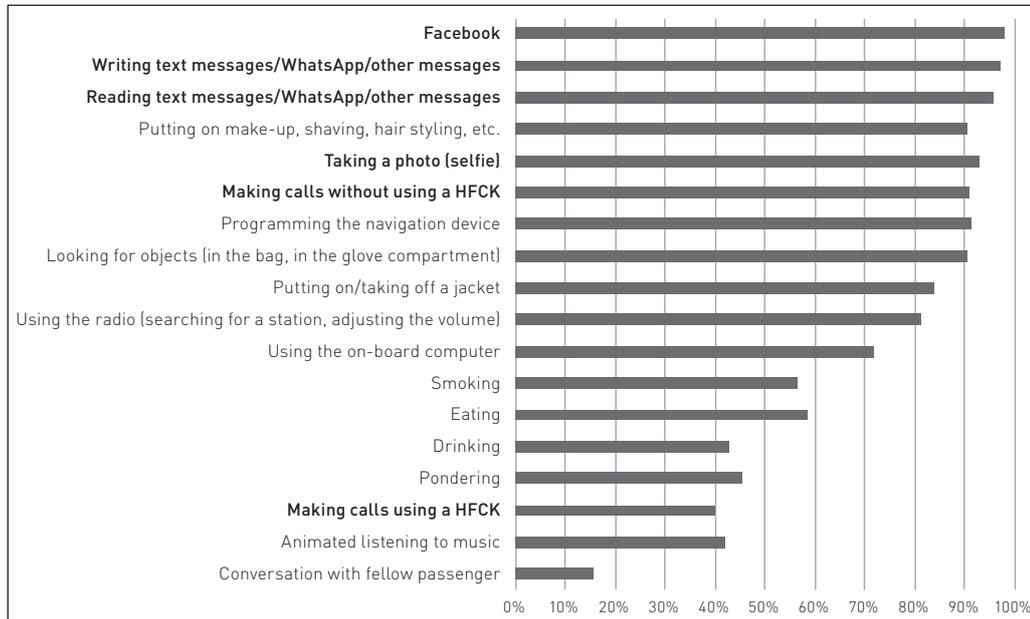


Figure 8: Behaviour while driving that new drivers consider to be (rather) dangerous according to the survey, n=256

In particular, accepting a call (31 %) was cited as the most dangerous. In terms of road safety, writing text messages (SMS, email, WhatsApp, etc.) and reading incoming messages were considered dangerous by 16 % and 13 % of respondents. The most dangerous behaviours were also found to include making calls or typing on the mobile phone (10 %). The survey of new drivers showed that all types of smartphone use, e.g. use of Facebook, reading and writing of messages (SMS/WhatsApp/other messages), taking photographs or even making calls without hands-free car kits, were considered most dangerous by the respondents. More than 95 % of respondents (see Figure 8) consider mobile phone and smartphone use, such as reading and writing all kinds of messages, to be rather dangerous; however, 24 % and 14 % of respondents respectively often use them while driving (see Figure 3, page 34) (Pilgerstorfer et al. 2017).

6. RECOMMENDATIONS WITH TIPS FOR DRIVERS

Road users are still not sufficiently aware of the danger of distraction caused by mobile phone or smartphone use in traffic and therefore the potential – often serious – consequences are underestimated. In recent years, for example, an increased risk potential has developed which should be given even more attention. Therefore, awareness-raising measures, among other things, are indispensable to minimise the risk of distraction in traffic.

The Austrian Road Safety Board tries to sensitise different target groups to the issue through innovative approaches. The online tool www.ab-gelenkt.at was developed in 2015 as an awareness-raising measure. In addition, workshops were held with children and young people of different age groups in which the consequences of distraction in traffic were demonstrated and experienced both practically and theoretically. Especially among young road users, the use and distraction of mobile phones and smartphones is widespread.

Further distraction workshops in companies are intended to raise awareness of distraction, especially among those who frequently drive professionally. The Austrian Road Safety Board is currently holding regular workshops throughout Austria. Further awareness-raising activities are continuously being developed and implemented.

Finally, a few tips were summarised which should be communicated above all to car drivers:

1. Minimise the operation of external devices of any kind in the vehicle. This way, you avoid taking your eyes and mind off traffic.
2. It is best not to make phone calls while driving. If possible, make a phone call before departure – stop at a safe place for urgent calls and make a phone call in peace. Only accept phone calls while driving with a hands-free car kit.
3. Keep both hands on the steering wheel. Reaching for your smartphone and the like increases the risk of an accident many times over.
4. Avoid time pressure. Carry out activities such as eating, drinking or smoking during breaks.
5. Use modern assistance systems. Typical conflict situations can thus be balanced out. Technical aids never replace personal responsibility.

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