



RSA

# USE OF MOBILE PHONES WHILE DRIVING - Effects on Road Safety

Research Department  
Monday, May 17, 2010

Údarás Um Shábháilteacht Ar Bhóithre  
Road Safety Authority

**Table of Contents**

<b>Introduction.....</b>	<b>3</b>
<b>Driver Distraction.....</b>	<b>3</b>
<b>Collision Risk.....</b>	<b>3</b>
<b>Effects of mobile phone use on driving performance .....</b>	<b>3</b>
<b>Mobile phone use and drink driving .....</b>	<b>4</b>
<b>Mobile phone use – conversation with a passenger – listening to music.....</b>	<b>4</b>
<b>Legislation.....</b>	<b>5</b>
<b>Effectiveness of Interventions to Reduce Mobile Phone Usage While Driving.....</b>	<b>5</b>
<b>Texting .....</b>	<b>5</b>
<b>References.....</b>	<b>6</b>
<b>Appendix 1.....</b>	<b>9</b>

## **Introduction**

This report focuses on the effect of mobile phone on driving performance and road safety. It is a short review of the research carried out on the subject. There are a large numbers of research sources on the topic. The research department in the Road Safety Authority has over a hundred research papers. The topic is also well referenced in all current traffic and transport safety publications (Cartt, Hellinga, & Bratiman, 2006). While there is ever increasing focus on driver distraction, and its role in increasing collision risk for road users, the evidence is relatively strong that mobile use by drivers, whether hand free or hand held, is major contributory factor in increasing distraction that can lead to increased collision risk.

## **Driver Distraction**

Driver distraction is thought to play a role in 20-30% of all road collisions. (Dews & Stayer, 2009). Distraction is caused by a competing activity, event or object from inside or outside the vehicle. Safety problems related to driver distraction are escalating as more technologies become available for use in motorized vehicles. Such a technology, already widely available and accepted, is the mobile phone. At the end of December 2009 there were 5,302,345 mobile subscriptions in Ireland (ComReg, 2009). While it is clear that mobile phones enhance business communication and increase personal convenience, use of mobile phones while driving has become a road safety concern.

The vast majority of drivers (39 % to 45%) report using their mobile phone at least sometimes while driving, and it is estimated that at any given moment during the day, 2 to 6% of the drivers is using a mobile phone (Road Safety Authority, 2010).

The mobile phone distracts drivers in two ways: it causes physical distraction and cognitive distraction. Physical distraction occurs when drivers have to simultaneously operate their mobile phone (i.e. reach, dial, hold) and operate their vehicle. Cognitive distraction occurs when a driver has to divert part of his/her attention from driving to the telephone conversation. However, the ability to divide one's attention between two simultaneous tasks is limited.

## **Collision Risk**

Mobile phone use while driving could therefore negatively affect driving performance. The results of epidemiological studies strongly suggest that using a mobile phone while driving can increase the risk of being involved in a road collision up to four times.

Probably the most famous and most frequently cited epidemiological study about the risks of mobile phone use while driving is the study of Redelmeier and Tibshirani (Redelmeier & Tibshirani, 1997). The researchers found that the risk of a collision when using a mobile phone was four times higher than the risk when a mobile telephone was not being used. The results of the study also suggested that hands-free phones offered no safety advantage over handheld units. Similar findings were achieved in other epidemiological studies (Laberge-Nadau, et al., 2003), (McEvoy, et al., 2005),

## **Effects of mobile phone use on driving performance**

What are the reasons for this four-fold increase in the risk of having a road collision when using a mobile phone? What makes a mobile phone so dangerous when used in a vehicle?

## *Use of mobile phones while driving – Effects on Road Safety*

Mobile phones potentially distract driver in several ways:

1. Physically: instead of focusing on the physical tasks required by driving (e.g. steering, gear changing), drivers have to use one or both of their hands to manipulate the phone.
2. Visually: mobile phones could visually distract drivers in two ways:
  - Firstly, drivers have to move their eyes from the road and focus on the mobile phone in order to be able to use it.
  - Secondly, while talking on a mobile phone, even if drivers' eyes are focused on the road, they 'look but do not see'.
3. Auditory: the focus of drivers' attention moves from the road environment to the sounds of the mobile phone and the conversation. This particularly applies when the sound quality is poor.
4. Cognitively: instead of focusing their attention and thoughts on driving, drivers divert their attention and focus on the topic of the phone conversation (Dragutinovic & Twisk, 2005).

A large number of studies have shown that using a mobile phone (a cognitive task) while driving degrades driving performance, (Parkes & Hooijmeijer, 2000), (Haigney, Taylor, & Westerman, 2000) (Strayer, Drews, & Johnston, 2003) (Strayer & Johnston, 2001), (Consiglio, Driscoll, Witte, & Berg, 2003) (Rakauskas, Gugerty, & Ward, 2004) (Tomros & Bolling, 2005) (Cooper, Zheng, Christian, Vavrik, Heinrichs, & Siegmund, 2003) (Hancock, Lesch, & Simmons, 2003) (Patten, Kircher, Ostlund, & Nilsson, 2004) (Liu & Lee, 2005), (Just, Keller, & Cynkar, 2008). (Caird, Willness, Steel, & Scialfa, 2008), (Hamada, 2008),

### **Mobile phone use and drink driving**

The comparison of mobile phones with alcohol impairment continues to attract researchers because of the already established thresholds and risks for alcohol impairment. In 2002, a study by the Transport Research Laboratory in the UK found that while driving while intoxicated is clearly impaired, certain aspects of driving performance are even more impaired by mobile phone use. (Burns, Parkes, Burton, Smith, & Burch, 2002). A similar study in 2006 that mobile-phone drivers may exhibit greater impairments than intoxicated drivers. (Strayer, Drews, & Crouch, 2006). However it should be noted that both studies found that length of impairment was obviously far less for the mobile phone users.

### **Mobile phone use – conversation with a passenger – listening to music**

Conversations with passengers in the real world are self-paced in contrast to phone conversations. Phone conversations are generally deliberately initiated conversations and, compared with a conversation with a passenger, are more purposeful and goal-directed with a faster exchange of information. Because the passenger is present during the whole journey, a conversation with a passenger can be conducted in a less urgent manner. In the case of a passenger conversation, the passenger is also aware of the driving situation and can sometimes even help draw attention to dangerous situations. In the case of a mobile phone conversation, the other person is generally not even aware that his/her conversation partner is driving, (Dragutinovic & Twisk, 2005). In a study in 2005 it was found that the normal conversations with a passenger were suppressed on the most demanding urban roads, for both driver and passenger. On the other hand, the mobile phone conversation prevented suppression from occurring in the passengers' conversations and even encouraged drivers to

## *Use of mobile phones while driving – Effects on Road Safety*

make more utterances that they would normally do in a normal passenger conversation (Crundall, Bains, Chapman, & Underwood, 2005).

Two studies comparing the effects of using a mobile phone and listening to music in vehicles. The studies concluded that the distraction of listening to music was far less than using a mobile phone. (Consiglio, Driscoll, Witte, & Berg, 2003), (Strayer & Johnston, 2001)

### **Legislation**

Most EU countries have introduced legislation aimed at restricting the use of mobile phones. The most common legislative measure is the ban on hand-held phones while driving a vehicle. Other measures include prohibiting the use of mobile phones – both hand-held and hands-free for special categories of drivers (e.g. school bus drivers) or young drivers, usually within the framework for a graduated licensing system, (Breen Consulting, 2009). The use of hand-held mobile phones while driving is illegal in over 40 countries (see appendix 1); most EU countries, Australia, and one Canadian province and the United States.

### **Effectiveness of Interventions to Reduce Mobile Phone Usage While Driving**

Evaluations of the effectiveness of the banning of mobile phone usage while driving have been carried out in Japan (ROSPA, 2002), Finland (Rajalin, Summala, Poysti, Anteroinen, & Porter, 2005), some US states (McCartt, Braver, & Geary, 2003) (McCartt & Geary, 2004) and in the United Kingdom (Broughan & Hill, 2004). Regarding the effectiveness of the ban on the use of handheld mobile phones, these studies show short-term effects of up to a 50% reduction of use, but the long-term effects are far less positive. The two studies in the US found that one year after the introduction of a ban; the use in the State of New York went back to the same level as before the law (McCartt et al., 2003; McCartt & Geary, 2004).

### **Texting**

Text messaging while driving has a negative impact on performance. This negative impact appears to exceed the impact of conversing on a phone while driving. (Drews, Yazdani, Godfrey, & Cooper, 2009). These findings were supported in another study which found that retrieving, and in particular, sending text messages has a detrimental effect on a number of safety critical driving measures. When text messaging, drivers' ability to maintain their lateral position on the road and to detect and respond appropriately to traffic signs was significantly reduced. In addition, drivers spent up to 400% more time with their eyes off the road when text messaging than when not texting messaging, (Hosking, Young, & Regan, 2006). Other research on texting and driving are including in the following studies; (Nemme & White, 2010) (Reed & Parkes, 2008)

## **References**

- Broughan, J., & Hil, J. P. (2004). *Mobile Phone Use by Drivers 2000-2004*. Crowthorne: Transport Research Laboratory.
- Burns, P. C., Parkes, A., Burton, S., Smith, R. K., & Burch, D. (2002). *How dangerous is driving with a mobile phone? Benchmarking the impairment to alcohol*. Crowthorne.: Transport Research Laboratory.
- Caird, J. K., Willness, C. M., Steel, P., & Scialfa, C. (2008). A meta-analysis of the effects of cell phones on driver performance. *Accident Analysis and Prevention* , 1282-1293.
- ComReg. (2009). *Irish Communications Market - Quarterly Key Data Report*. Commission for Communications Regulation.
- Consiglio, W., Driscoll, P., Witte, M., & Berg, W. P. (2003). Effect of cellular telephone conversations and other potential interface on reaction time in a braking response. *Accident Analysis and Prevention* , 35, 495-500.
- Consulting, J. B. (2009). *Car Telephone Use and Road Safety*. European Commission.
- Cooper, P. J., Zheng, Y., Christian, R., Vavrik, J., Heinrichs, B., & Siegmund, G. (2003). The impact of hands-free message reception/response on driving task performance. *Accident Analysis and Prevention* , 35, 23-35.
- Crundall, D., Bains, M., Chapman, P., & Underwood, G. (2005). Regulating conversation during driving: a problem for mobile telephones? *Transportation Research Part F, vol. 8, no. 3, p. 197-211.* , 187-211.
- Dews, F. A., & Stayer, D. L. (2009). Cellular Phones and Driver Distraction. In M. A. Regan, J. D. Lee, & K. L. Young, *Driver Distraction Theory, Effects and Mitigation* (pp. 169-190). CRC Press.
- Dragutinovic, N., & Twisk, D. (2005). *Use of mobile phone while driving - effects on road safety*. SWOV Institute for Road Safety Research The Netherlands.
- Drews, F. A., Yazdani, H., Godfrey, C. N., & Cooper, J. M. (2009). Text Messaging During Simulated Driving. *Human Factors* , 762-770.
- Haigney, D. E., Taylor, R. G., & Westerman, S. J. (2000). Concurrent mobile (cellular) phone use and driving performance; Tasks demand characteristics and compensatory processes. *Transportation research Part F* , 3, 113.121.
- Hamada, T. (2008). Experimental analysis of interactions between 'where' and 'what' aspects of information in listening and driving; A possible cognitive risk of using mobile phones during driving. *Transportation Research Part F* , 75-82.
- Hancock, P. A., Lesch, M., & Simmons, L. (2003). The distraction effects of phone use during a crucial driving maneuver. *Accident Analysis and Prevention, vol. 35, no. 4, p. 501-514.* , 501-514.

## **Use of mobile phones while driving – Effects on Road Safety**

- Hosking, S., Young, K., & Regan, M. (2006). *The Effects of Text Messaging on Young Novice Driver Performance*. Monash University Accident Research Centre (MUARC).
- Just, M. A., Keller, T. A., & Cynkar, J. (2008). A decrease in brain activity associated when driving when listening to someone speak. *Brain Research* , 70-80.
- Laberge-Nadau, C., Maag, U., Bellavance, F., Lapierre, S. D., Desjardins, D., Messier, S., et al. (2003). Wireless Telephones and the risk of road crashes. *Accident Analysis and Prevention* , 5, 649-660.
- Liu, B.-S., & Lee, Y.-H. (2005). Effects of car-phone use and aggressive disposition during critical driving maneuvers. *Transportation Research Part F* , 8, 369-382.
- McCartt, A. T., & Geary, L. L. (2004). Longer term efforts of New Yorks State's law on drivers' handheld phone use. *Injury Prevention* , 11-15.
- McCartt, A. T., Braver, E. R., & Geary, L. L. (2003). Drivers' use of handheld cell phones before and after New York State's cell phone law. *Preventive Medicine* , 629-935.
- McCartt, A. T., Hellinga, L. A., & Bratiman, K. A. (2006). Cell Phones and Driving : Review of Research. *Traffic Injury Prevention* , 89-106.
- McEvoy, S. P., Stevenson, M. R., McCartt, A. T., Woodward, M., Haworth, C., Palamara, P., et al. (2005). Role of mobile phone in motopr vehicle crashes resulting in horpital; attendance: a case-crossover study. *British Medical Journal* .
- Nemme, H. E., & White, K. M. (2010). Texting while driving; Psychosocial influences on yound people's texting intentions and behaviour. *Accident Analysis and Prevention* .
- Parkes, A., & Hooijmeijer, V. (2000). *The influence of the use of mobile phones on driver situation awareness*. Nataional Highway Traffic Safety Administration.
- Patten, C. J., Kircher, A., Ostlund, J., & Nilsson, L. (2004). Using mobile telephones; cognitive workload and attention resource allocation. *Accident Analysis and Prevention*, vol. 36, no. 3, p. 341-350. , 341-350.
- Rajalin, S., Summala, H., Poysti, L., Anteroinen, P., & Porter, B. E. (2005). In-Car Cell Phone Use and Hazards Following Hand Free Legislation. *Traffic Injury Prevention* , 225-229.
- Rakauskas, M. E., Gugerty, L. J., & Ward, N. J. (2004). Effects of naturalistic cell phone conversations on driving performance. *Journal of Safety Research* , 453-464.
- Redelemeir, D. A., & Tibshirani, R. J. (1997). Association between cellular telephone calls and motor vehcile crashes. *The New England Journal of Medicine* , 363, 453-458.
- Reed, N., & Parkes, A. (2008). *The Effects of Text Messaging on Driver Behaviour A simulator study*. Transport Research Laboratory.
- Road Safety Authority. (2010). *National Survey of Driving Attitudes and Behaviour*. Unpublished.

### ***Use of mobile phones while driving – Effects on Road Safety***

ROSPA. (2002). *The risk of using a mobile phone while driving*. Birmingham: The Royal Society for the Prevention of Accidents.

Strayer, D. L., & Johnston, W. A. (2001). Driven to distraction; Dual-task studies of simulated driving and conversing on a cellular telephone. *Psychological Science*, 9, 462-466.

Strayer, D. L., Drews, F. A., & Crouch, D. J. (2006). A comparison of the cell phone driver and the drunk driver. *Human factors*, 48, 381-391.

Strayer, D. L., Drews, F. a., & Johnston, W. A. (2003). Cell phone induced failures of visual attention during simulated driving. *Journal of Experimental Psychology: Applied*, 9, 23-32.

Tornros, J. E., & Bolling, A. K. (2005). Mobile phone use – Effects of handheld and hands-free phones on driving performance. *Accident Analysis and Prevention*, 902-909.

## Appendix 1

Overview of existing mobile phone legislation in various countries (source: <a href="http://www.cellular-news.com/car_bans/">www.cellular-news.com/car_bans/</a> ; as at December 2008).		
Country	Hand-held banned	Notes
Australia	Yes	Banned in all states - fines vary.
Austria	Yes	Fines vary - up to US\$22 per incident
Belgium	Yes	Phones can be used without a hands-free unit when the car is stationary - but not while in traffic (such as at traffic lights)
Brazil	Yes	Ban imposed Jan. 2001
Bulgaria	Yes	Ban imposed May 2002 - fines of US\$15 per infraction
Canada	One province	Banned in Newfoundland (Dec2002) fines up to US\$180
Chile	Yes	
Czech Republic	Yes	
Denmark	Yes	Ban imposed July 1998 - US\$60 fine for infringements
Egypt	Yes	Fines of about US\$100 per offence.
Finland	Yes	Ban imposed January 2003 - US\$55 fine for infringements
France	Yes	Ban imposed June 2003 - US\$42 fine per infraction
Germany	Yes	Ban imposed Feb. 2001 - usage allowed without a hands-free unit only when the engine is switched off.
Greece	Yes	
Hong Kong	Yes	
Hungary	Yes	Fines up to US\$20 per infraction
India - New Delhi	Yes	Ban extended to all use of mobile phones when driving, including use with a hands-free unit - July 2001
Ireland	Yes	Banned, with a US\$380 fine and/or up to 3 months imprisonment on a third offence. Hands-free kits allowed, although that is subject to review.
Isle of Man	Yes	Banned since July 2000
Israel	Yes	
Italy	Yes	Fines of up to US\$124 per infraction
Japan	Yes	Ban imposed Nov. 1999
Jersey	Yes	Ban imposed Feb. 1998
Jordan	Yes	Ban imposed Oct. 2001
Kenya	Yes	Ban imposed late 2001
Malaysia	Yes	
Netherlands	Yes	
Norway	Yes	Fines of over US\$600 per infraction
Pakistan	Partial	Banned in Islamabad
Philippines	Yes	
Poland	Yes	Fines can be as high as US\$1,000
Portugal	Yes	
Romania	Yes	

Russia	Yes	Ban imposed March 2001
Singapore	Yes	
Slovak Republic	Yes	
Slovenia	Yes	
South Africa	Yes	
South Korea	Yes	Ban imposed July 2001 - US\$47 fine + 15 points on the license.
Spain	Yes	Ban imposed 2002 - only fully fitted car kits are permitted.
Sweden	No	
Switzerland	Yes	
Taiwan	Yes	If the driver has a reflective screen on the car, local privacy laws forbid stopping the car for violating the ban.
Thailand	Yes	
Turkey	Yes	
Turkmenistan	Yes	With effect from May 1st 2003.
UK	Yes	Banned from December 2003. In February 2007 the penalties for using a hand-held phone increased to three penalty points and the fine was doubled to £60.

# Working To Save Lives

## Údarás Um Shábháilteacht Ar Bhóithre Road Safety Authority

Páirc Ghnó Ghleann na Muaidhe, Cnoc an tSabhaircín, Bóthar Bhaile Átha Cliath, Béal an Átha, Co. Mhaigh Eo  
Moy Valley Business Park, Primrose Hill, Dublin Road, Ballina, Co. Mayo  
local: 1890 50 60 80 fax: (096) 25 000 email: [info@rsa.ie](mailto:info@rsa.ie) website: [www.rsa.ie](http://www.rsa.ie)