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In-car distractions and their impact on driving activities

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Abstract

In-car distractions can seriously impair driving and potentially contribute to accidents. In-car distractions include mobile phones, entertainment systems, interaction with passengers, and most recently satellite navigation systems. This study investigates such distractions by providing micro-detailed descriptions and analyses of their occurrence and impact on driving activities, such as looking towards the road ahead or handling the steering wheel. The study uses naturally occurring data, in-car video recordings of driving in real-world driving situations. The study examines in detail how different forms of in-car distractions develop in situ in real time, and relative to driving activities and to one another.

CONTENTS

EXECUTIVE SUMMARY

This report documents the findings from an international research project that investigated in-car distractions and how they occur and impact driving activities. The project has been funded by the Department of Infrastructure, Transport, Regional Development and Local Government and completed in collaboration with a researcher in Finland and cooperation with a researcher in the UK. The study is timely. Recently there has been an increased public and scholarly interest in distracted driving in Australia as well as more globally. The main objective and innovation of this research project has been to use both quantitative and qualitative methods for improving the understanding of the nature of in-car distractions, including the documentation of their diversity, characteristics, and development. Specifically, this project aims to introduce a new qualitative research methodology for driving safety research and thereby to enrich research on driving distractions by introducing new data, new analyses and new findings.

Plenty of important research on driving distractions exists already. A distraction is an element of the driving situation which demonstrably influences the driver's attention to, and participation in relevant driving activities, and does not contribute to relevant driving activities. Distractions are frequent and are known to contribute to road accidents. Research is typically undertaken in psychology, engineering and design, and accident analysis and it usually draws on data collected from questionnaires and crash statistics or in experimental driving simulators and test situations, prior research has identified many forms of distractions, such as mobile phones, entertainment systems, eating and drinking, and conversation with passengers and studied their impact on the driver's behaviour, often with respect to various driver characteristics, such as age or gender. The research has studied for example how much time of driving is spent on distracting behaviour and to what extent they are contributing factors in accidents. Some research has also studied how distracting activities led to driving performance errors (e.g. lane deviation or missed traffic signs). Nevertheless, relatively little is still known about how distractions emerge, are managed and solved in real-world driving situations.

This study supplements prior research by drawing on data recorded in real-life driving situations (with no testing or planning involved) and by introducing and using a methodology that has not to date been used in driving safety research. It examines the real-time nature and occurrence and the diversity of in-car distractions and their potential impact on driving activities. Distraction is defined as a visible outcome of some event, action or feature in the driving situation inside the car that impacts driving activities so that it, for example, involves the driver looking away from the road, removing a hand from the wheel, reorienting the body away from forwards driving activity or in other ways attending to something other than driving. It also studies how different distractions co-occur, relate to and lead to one another. Although there is growing public awareness of the significance of driving distractions (especially mobile phones and GPS navigators) and laws to regulate them, there is little knowledge of the nature and potential impact of some of these distractions on driving.

Methodological background

Existing driving safety research has often voiced a need for and the potential value of new research methodologies that enable the study of real-life, natural driving situations. In addition to the quantitative part, this research project has specifically attempted to complement a broad range of research methodologies used in driving safety research by drawing on a qualitative methodology that is new to driving research. This methodology is grounded in two fields within sociology, *conversation analysis* and *ethnomethodology*, and is also informed by *gesture studies* and *multimodal interaction analysis*. This methodology relies on videorecorded data collected in

naturally occurring, real and ordinary driving situations. In the project, 27 hours of video recordings of driving during real-world journeys were collected in Australia. These data were supplemented with approximately 20 hours of data collected by Dr Pentti Haddington in Finland and by approximately 60 hours of data collected by Dr Eric Laurier and his colleagues in the United Kingdom. After data collection, investigators identified moments when in-car distractions occurred. These moments' frequency and duration were documented. After this investigators focused on specific in-car distractions. These were transcribed, described and analysed in micro-detail with regard to their features, development, real-time occurrence and connection with other events and activities inside and outside the car. The particular benefit and innovativeness of the used methodology is that it enables a detailed analysis and description of driver and passenger actions and other driving related events as they unfold moment-by-moment and build upon just prior actions and events in the driving situation. In essence, this methodology enables the analysis of how one action or event leads to another. As regards driving distractions specifically, the use of this methodology can be used to explain for example:

- what in-car distractions look like in real-life driving situations;
- how different in-car elements of the driving situation might be or become distracting for the driver;
- how drivers initiate or react to distractions;
- how some action or event occasions, in real time, a particular driving distraction;
- how in-car distractions occur and develop relative to one another;
- how in-car distractions impact or impair driving;
- how drivers coordinate in-car distractions with driving; and
- how drivers manage and resolve in-car distractions during driving.

Main quantitative results

The quantitative results are drawn only from the video recordings collected in Australia. Although the amount of data (27 hours) collected in Australia is more than sufficient for a detailed and close micro-analysis of driving distractions, for a quantitative analysis they are limited both with respect to the amount of data and the sample of individual drivers (n=9). Although the quantitative results are interesting and useful in that they can be indicative of and may identify ordinary driving behaviours, the study does not aim to present comprehensive, representative or generalisable quantitative results.

The quantitative results suggest that such distracting activities as talking (in 100% of journeys with passengers), grooming (91%), the adjustment of entertainment system (58%) and searching for objects inside the car (44%) were the four most frequent distracting activities, whereas reading (1%), texting (2%), eating and drinking (8%) and making / receiving a mobile phone call (9%) were among the four least frequent distracting activities. Other identified distracting activities included singing and drumming, adjusting climate control and passenger influence.

A recent study conducted in Britain by the Department for Transport (DfT 2009: 10) reported that in 40% of all car journeys there is more than one person in the car. In the present study, in 51% of the journeys there were passengers present in the car. These figures combined with the finding in the present study that conversation with passengers occurred in all journeys with passengers (on average 60% of journey time was spend on conversing) suggests that more qualitative and empirical research is required to better understand the impact of different types of conversations and different types of passengers on the driving activity in cars. Consequently, although the above figures are not representative and generalisable, qualitative analyses of these distractions, for example on how conversation with passengers or a mobile phone call can emerge as and develop into a significant

distraction to driving, are important for receiving a broader understanding of the influence and impact of distractions on driving.

Main qualitative results

The most important contribution of this report to existing distraction research is that it relies on micro-detailed transcription made of videorecordings of naturally occurring data in order to qualitatively analyse and examine the behaviours and practices of drivers and passengers in real-world and real-time settings. The qualitative results build upon analyses and findings from the video recordings that were collected in Australia, Finland, and the United Kingdom.

The qualitative part of the study considers in detail such recognised in-car distractions as talk with passengers, the use of mobile phones, eating, grooming, the use of the entertainment system, and the use of the air conditioning system. The analysis shows in detail how and when relative to driving and other events and actions inside the car drivers engaged in these distracting activities and how distractions are adjusted with driving. The analysis also shows who (driver, passengers) or what (objects) are involved in the distraction. In general, the findings in this study provide an important background for further qualitative as well as experimental research.

Distractions can be finely coordinated with the driving activity

The report shows that drivers can and do often coordinate distracting activity with the demands of driving. Drivers are often seen to start and stop distracting activities in ways that orient to the requirements of the traffic flow, driving and changes in traffic signalling, when the car is stopped, slowing down or picking up speed. At these moments, drivers are often seen for example to handle and search for objects, attend to passengers and their requirements and to adjust the entertainment system or the air conditioning system. This suggests that drivers orient to the potential impact of distracting activities on the driving activity and thereby try to engage in these activities when the demands of driving are lower.

At these moments, drivers, however, are often faced with the challenge of how to end a distracting activity when the driving requirements increase, e.g. when traffic lights turn green or traffic starts moving again. The analysis has shown that drivers sometimes fail to end a distracting activity at precisely the moment when driving requires attention and action.

Distractions can extend over time

The examples in the report show that distractions may occur not as a one-off event, but can extend and develop over time, sometimes over a substantial period of time of many minutes. Such distractions can include interaction with passengers, the use of and adjustment to the entertainment system, and the use of different kinds of non-driving related objects in the car.

Distractions can be planned, predictable and controlled

The analysis shows that some distractions can be staged, timed, planned and controlled, and thereby can be anticipated by the driver. Distractions can also be paused, abandoned and resumed. In some situations, passengers can help drivers to manage a distraction. Some examples showed, for instance, how drivers were able to control the time and development of an eating / feeding activity. The examples also show how drivers can store and position objects in the car so that they can be reached easily (e.g. mints, handkerchiefs, sunglasses, maps, moisturising lotion, mobile phones) when they are needed. One interesting finding concerns the use of mobile phones in cars. The

analysis suggests that before the actual conversation on the phone, drivers are able to plan and control outgoing mobile phone calls more easily than incoming calls. A ringing phone makes relevant a quick answer, whereas the preparations for an outgoing call (finding and reaching for a phone, looking at the phone's display, pressing buttons on the phone) can be suspended or stopped when driving so demands.

Distractions can be unplanned, unpredictable and uncontrolled

The analysis also shows that some distractions can be unpredictable and pose immediate demands on the driver. One important unpredictable distraction is an incoming mobile phone call, which cannot be predicted or controlled. Also cut-off phone calls and in-coming calls to passengers' mobile phones cannot be planned or controlled in advance. The analysis shows that calls to passengers' phones can be journey-related and thereby require the driver's attention and participation in the phone call. Many examples also show that some unplanned distractions must be dealt with in order for the journey to continue. In many cases a phone call is required to get further information about the destination and the route. In one example, the driver forgets an address list home and cannot remember their destination (a cognitive distraction), which occasions a need to make a phone call to get hold of the address.

Other unplanned distractions often involve passengers. The analysis shows how a dog falling off the rear seat prompts the driver's head to turn to the direction of the noise caused by the fall. Child passengers specifically often pose a continuous source of distraction. One reason for this, as the analysis shows, is that children are not able to evaluate the driving situation and therefore are not able to adjust and coordinate their behaviour with driving demands in the way that adults can. Children also often produce requests, questions and other attention-seeking and attention-requiring actions that require the driver's response.

Unplanned and unpredictable distractions often cannot be timed and managed conveniently with the driving demands but require the driver to coordinate the demands of both distraction and driving. In many examples, a distraction occurred simultaneously with a demanding driving situation, e.g. a turn at an intersection, which can further add to the complexity of the driving situation.

Distractions occur relative to each other

The analysis shows importantly that distractions do not occur independently or necessarily one at a time, but that they occur relative to each other. First, distractions can occur one after the other, i.e. they occur in series. This means that drivers can engage in several distracting activities that follow each other in time but that are not connected to each other. A driver can for example reach for an object and after that use the entertainment system. Second, distractions can lead to, make relevant or provide an opportunity for other distractions, i.e. they occur in sequences. For example, a cut-off phone call leads to the driver redialling. The analysis also shows how the content of the mobile phone call makes relevant a search for pen and paper in order to write down an address. Third, distractions can occur simultaneously. These situations often involve children. The analysis shows for example how children can require attention at the same time that the driver is talking on a mobile phone and driving the car in busy traffic.

Distractions are physical

The report shows that distractions do not just pose a challenge for the driver's cognition but that they are also physical and involve the driver looking in different locations and directions, the driver moving his/her upper body, the driver reaching for objects in storage areas and so on. Such physical

and embodied demands can be occasioned by interaction with passengers or with objects, or for example by a ringing mobile phone.

Distractions can originate from the driver or from elsewhere

The report shows that some distractions originate from the driver. Drivers can for example start eating and start mobile phone calls. Drivers can also start using objects while driving and initiate conversations. In addition to this, distractions can also originate from passengers or for example from technologies, in which case the driver's response is often made relevant, expected or required. Passengers can for example initiate conversations. Child passengers especially can be demanding and insist on responses from the driver. Different kinds of technologies can also require or be treated as making relevant the driver's actions. One example of this is an in-coming phone call or a text message. There can also be many other unprecedented events (such as a child doing something unexpected in the back seat) that can momentarily have an impact on and divert the driver's attention away from the driving activity.

Distractions are designed for

The analysis shows that, and how, features of vehicle design allow for and shape the occurrence of various forms of distraction. In some cases, the design of the car interior can maximise driver convenience and help drivers to coordinate distractions, in other cases it might be that the design of the car interior enables and contributes to the driving in a negative way when the driver is distracted.

Distractions are qualitatively different

The overall analysis shows that distractions are qualitatively different from each other. Some distractions are easier to stop, postpone and coordinate with the demands of driving than others. It is possible that it is easier to stop or postpone distractions that involve only the driver than it is to stop or postpone distractions that involve other actors or participants (e.g. a person at the other end of a mobile phone). In addition, there are differences in how drivers use and orient to mobile phones *before* a phone call: answering a phone has very different kinds of requirements than preparing for an outgoing mobile phone call. More empirical research is required to better understand the different ways in which a mobile phone poses a distraction to driving.

Implications

This study introduces a new qualitative and empirical methodology to driving safety research and also provides a new way to understand, approach and study 'distractions' as embodied, real-time and real-life phenomena in cars. It has been able to describe in detail the shape and quality of already recognised driving distractions and to identify *when* they occur, *how* they develop and occur and *how* they are responded to and managed together with the simultaneous driving demands. Specifically, this study has been able to describe the role of passengers in cars as sources of distractions and as participants that can help drivers with different distractions. Similar research in the future can further help to improve the understanding of when and how distractions occur and how they develop and impact driving and drivers' actions.

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Some data examples used for qualitative microanalyses were collected as part of the Finnish-based project *Talk&Drive: Mobility, Language and Embodied Practices as Resources for Social Action in Face-to-Face and Mobile Phone Interaction in Cars* led by co-investigator Dr Haddington (and conducted with co-investigators Dr Mirka Rauniomaa and Dr Tiina Keisanen, and with research assistant Ms Minna Pelkonen). That project was funded by The University of Oulu, the University of Helsinki and the Emil Aaltonen Foundation (http://www.oulu.fi/hutk/english/TalkAndDrive/). Other examples for microanalysis were provided by Dr Eric Laurier, Senior Research Fellow at the Institute of Geography at Edinburgh University. These recorded examples were collected for the project *Habitable Cars: The Organisation of Collective Private Transport*, which was funded by the Economic and Social Research Council (UK) and led by Dr Laurier (with co-investigators Dr Hayden Lorimer and Dr Barry Brown). We are very grateful to Dr Laurier for his interest and for so generously allowing us to use these data.

We appreciate the feedback we have received from colleagues at data sessions and workshops at the Australian National University, in Finland at the University of Oulu and the University of Helsinki, and at the University of Southern Denmark. In particular, Dr Tiina Keisanen helped to inform our early thinking.

Finally, the project would not have been possible without the participation of the drivers and passengers who agreed to be filmed in ordinary everyday driving journeys, and so to them we express our deep appreciation.

ABBREVIATIONS

CA	Conversation analysis
dvr	driver
EM	Ethnomethodology
FP	front (seat) passenger
LH	left hand
LRP	left rear passenger
RH	right hand
RVM, rvm	rear view mirror
RRP	right rear passenger

1 INTRODUCTION

1.1 Background

1.1.1 The problem: distraction and driving

The study is generally concerned with distracted driving. Around the time of preparing this report, driver distraction was featuring regularly in the news. For example, a policeman stopped a driver after observing him to be steering with his knees and with only one finger on the wheel, while using two mobile phones. With a phone in each hand, the driver was apparently transferring information from one phone to the other (*Sydney Morning Herald*, 19 October 2009). A driver who hit and seriously injured a pedestrian later claimed that at the time he was lost and flustered, and was trying to turn on his navigation system and was rummaging for cigarettes (*Herald Sun*, 26 January, 2010). In other incidents, a state politician was in the news because he had been caught allegedly speeding. He explained that he had become unaware of his speed because he was distracted by a new music CD that he was listening to at the time. In another incident, the nightly sports news captured a distracted driving incident when an elite professional footballer was hit (only slightly) by an on-field mini equipment vehicle, whose driver was talking on a mobile phone.

Research and experience in Australia and internationally has established that driver distraction is an important issue for road safety (Lee 2008). Distractions can be a significant feature of the ordinary driving environment and experience. Australian and international studies have shown that drivers commonly engage in distracting activities while driving, and that distraction is a contributing factor in 14–21% of crashes (McEvoy 2007). US researchers have suggested even higher figures of up to 30% (Stutts 2005). A study by the US National Highway Traffic Safety Administration estimated that driver distraction contributed to around 1.2 million police-reported accidents per year (cited in Stutts and Hunter 2003; and see McEvoy et al. 2006a). Stevens and Minton (2001) report that in England and Wales in-car distractions are a contributing factor in around 2% of fatal accidents, though this figure is thought to be conservative. Studies from other countries report even higher rates. Stutts and Hunter (2003) report on data from the US national crashworthiness system to identify that around 8% of drivers were found to be distracted at the time of the accident, with drivers 20 years old or younger producing a higher average of at least 11.7% (and likely higher). Drivers with high involvement in distraction related crashes and near-crashes tend to be younger and less experienced behind the wheel (Klauer et al. 2006). Also, it seems that drivers involved in distraction related accidents are typically not caught out at some inopportune moment, but are likely to be the drivers who engage more frequently in distracting non-driving activities (Klauer et al. 2006). There is evidence that the drivers may be either unaware of potential detriments to driving performance of distractions (Horrey, Lesch and Garabet 2008), or may be aware of the potential danger but still engage in distracting behaviours (Vanlaar et al. 2008; Walsh et al. 2008).

The present study is timely because it builds on a number of recent efforts to focus attention on distraction in driving. In Australia, the Australian Transport Council's *National Road Safety Action Plan 2007 and 2008* (ATC 2007, and see also the recent plan for 2009–2010) discussed 'distracted driving' as one of its action areas for 2007–2008, within 'Safer road users and safer behaviour'. This study supports the Plan's aim to develop knowledge to encourage road user behaviour so that unsafe behaviours are exhibited less frequently, and specifically by increasing drivers' awareness of risk factors (p.37). The present study investigates the real-world characteristics and impact of sources of driver distraction indicated in the ATC's *Action Plan*. The *Action Plan* (p.40) notes that sources of distraction have increased substantially in recent years, and that the combined effects of internal and external stimuli generate much potential for distraction. The *Action Plan* (pp.41–42)

lists among "fatigue and distracted driving" performance indicators the value of conducting and monitoring further research, including for example observation studies of mobile phone use by drivers. The present study includes mobile phone use, and goes further to consider many other forms of in-car distraction. The study uses a form of observation method and so complements the survey, laboratory, and crash studies which informed the ATC *Action Plan 2007 and 2008*.

'Driver distraction' was the focus for a recent Victorian government *Inquiry into Driver Distraction* (Parliament of Victoria 2006). That inquiry drew substantially on existing research literature to consider how distraction in driving can be measured, its role in crashes, and the various forms which distraction can take. The Inquiry considered distractions both inside and outside the car (e.g. road signs and advertising). The inquiry sought to identify implications for laws and enforcement and to make recommendations to enhance road safety by increasing the profile in VicRoads strategies, driver training and school road safety programs. The Inquiry also considered technological developments for collecting data on the circumstances of road crashes and for providing insights into driver behaviour, including distractions.

Internationally, the recent first international conferences specifically concerned with research on 'distracted driving' (Toronto 2005) called for increased and wider research efforts, and new research directions (Hedlund et al. 2006; see conference website at www.distracteddriving.ca/english/index.cfm). In particular, a number of papers at the conference called for observation based studies and real-world data to increase knowledge of distracted driving, and to complement survey and experimental studies. This study advances existing research using video data of real-life driving behaviours (e.g. Stutts et al. 2003) by drawing on specific expertise for micro-detailed transcription and analysis of naturally occurring behaviours and activities and practices.

The prominent journal *Human Factors* included in a 2004 issue a Special Section collection on driver distraction. In particular, papers in the collection pointed to a number of problems confronting design and regulation of in-vehicle technology. In their preface to the section, Lee and Strayer (2004:585–6) note that investigating such problems requires integration of results from a range of studies which address, among other things, that drivers are not passive recipients of distracting stimuli, and that a powerful factor influencing distraction is social norms governing behaviours and acceptable risks.

It is likely that the significance of distracted driving for road safety will only increase in the years to come (Regan 2004; Parliament of Victoria 2006). The number of sources of potential in-car distraction seems only to be increasing, and so too are their possible means for distracting drivers. Hedlund, Simpson and Mayhew (2006: viii) note that distracted driving may be particularly prevalent because it involves lifestyle issues, for example an "almost natural propensity to attend to objects, events or activities that are new, novel or engaging". They suggest further that "[b]eing distracted is virtually a way of life" (2006: viii), and that driving time is increasingly seen as unproductive unless it is also an opportunity for accomplishing other tasks (viii). We all seem to want to do more than one thing at a time. It is important therefore to know much more about the nature of distracted driving.

1.1.2 Aims and scope of the present study

Specifically, this study investigates *in-car distractions* and how they occur and can impact driving activities. The study uses video recordings of ordinary driving journeys to identify and examine distractions as they occur in real-world driving situations. The study uses both quantitative and qualitative analytic methods to improve understanding of the nature of in-car distractions, including their diversity, characteristics, and development. The present study examines only *in-car* distractions, and therefore does not consider distractions outside the car and relating for example to

events or features of the external driving environment such as advertising, street signage, or other points of visual interest or attraction.

Importantly, distractions can occur throughout extended periods of driving or at critical times in driving activity and relative to changes and events in the driving environment. Distractions can seriously impair driving, but drivers may not be aware of their risk. Some sources of distraction (e.g. mobile phone use) and their possible impact on driving safety have achieved at least some level of recognition in the wider community, and are addressed by road safety laws. However, the presence and potential significance of other sources of distraction which are not (and will not be) addressed by road safety laws may be mostly unrecognised in the wider community (e.g. entertainment system, eating, personal grooming). An aim of the present study is to increase knowledge of distractions as part of real-life driving situations.

The study seeks specifically to complement the range of research methodologies already actively employed to investigate distraction in driving, and typically positioned in fields within psychology, engineering and design, and accident analysis. The study therefore does not use experiments, survey/interview instruments, or accident data analyses, but instead uses a method for the detailed description and analysis of naturally occurring real-time situated and embodied human activity. The study seeks to move beyond noting, coding and counting particular types (sources) of distraction to examine what distractions actually look like as they originate and develop in situ in the ordinary day-to-day real-time reality of driving. The study therefore aims to enrich research on distraction in driving by providing new forms of data and analyses, and new forms of findings.

As a departure from much of the driving and road safety literature on distractions, this study does not measure actual impacts on driving performance, or make judgements about driving quality (e.g. errors) or assumed demands on drivers' attention. Instead, the study emphasises the nature of distractions and their immediate and real-life real-time impact on driving activities, such as looking towards the road ahead, maintaining hand contact with the steering wheel, and orienting the body forwards towards the relevant activity space for driving.

Summary of aims and contributions

Discovery

- to understand better the nature of distracted driving, and the car as a multi-activity setting
- to document the occurrence of in-car distractions, from origin to response and resolution, in real-time real-world driving situations
- to identify the features of in-car distractions and explore how they can impact driving activities
- to detail the demands of in-car distractions on the driver and on driving activities
- to examine how drivers manage distractions
- to relate the occurrence of in-car distractions to events in the external driving environment (e.g. traffic, road conditions, road and traffic signalling)
- to examine the complex nature of driving as an attentional, physical and material (embodied), and social activity
- to increase knowledge of the impact of passengers on driving
- to increase knowledge of naturally occurring activities and practices

Method

- to bring a specialist and innovative research methodology and expertise to road safety research – micro-transcription and analysis of video recordings of naturally occurring driving activity
- to identify possible behavioural variables for future research

Benefits

- to inform driver training programs
- to inform relevant road safety related laws
- to inform road safety campaigns for increasing public awareness of distraction and its potential to impact safe driving activities
- to increase knowledge of the nature of distraction in driving
- to increase the pool of Australian researchers in road safety
- to foster national and international research partnerships in road safety research
- to complement existing research methods for investigating distraction in driving

1.2 Defininining distraction

What do we mean by 'distraction', 'driver distraction', or 'distracted driving'? There is yet no commonly accepted definition of distraction in driving (Parliament of Victoria 2006), and human factors researchers have called for one (Green 2004). For example, distractions are not necessarily avoidable and may not necessarily impair driving. In simple terms, a 'distracted driver' gives less than appropriate attention and participation to driving activities (Ranney et al. 2000; Stutts et al. 2001). There is some acceptance in the research literature that a distraction may be initiated by the driver or may come from some other source, and may arise from either inside or outside the vehicle. A distinction is also often made that a distraction is *not* related to impairment from alcohol or drugs, or a medical condition (Sheridan 2004; Tasca 2005; cf. Strayer et al. 2006). Also, distraction is often thought to involve some form of triggering event, and is not the same as inattention (Beirness et al. 2002).

Pettitt et al. (2005) set out specifically to review definitions of driver distraction in the research literature, and noted the absence of a comprehensive definition. Indeed they noted that many studies use no specific definition of 'distraction', and that this can be problematic because the general everyday meaning of 'distraction' does not allow for the complexities of driving (p.3). Rather, studies assume the definition of The International Standards Organisation (ISO), which defines 'distraction' as "attention given to a non-driving related activity, typically to the detriment of driving performance" (ISO 2004, cited in Pettitt et al. 2005:3). Pettitt et al. (2005) argue, however, that while this definition rightly highlights the impact on the driving task, it is not very comprehensive. For example, they identify instead the definition of The American Automobile Association Foundation for Traffic Safety, which defines distraction as occurring when "a driver is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object or person within or outside the vehicle compelled or tended to induce the driver's shifting attention away from the driving task" (Young et al. 2003, cited in Pettitt et al. 2005:3). They note also that the Indiana Tri-Level Study of the Causes of Traffic Accidents defines *internal* distraction specifically as when attention is given to a "competing event, activity, or object inside the vehicle" (Wang et al. 1996, cited in Pettitt et al. 2005:3), though this definition does not identify the possible types of distraction.

For example, of in-car distractions, Ranney et al. (2000) classify four distinct categories as follows: visual (looking away from road); auditory (e.g. responding to a phone, or another occupant); biomechanical (e.g. adjusting a CD player); and cognitive (e.g. lost in thought). It is thought likely that these different types of distraction can have different forms and levels of impact on driving. As Svenson and Patten (2005) put it, driving activities are the primary task for the vehicle operator, for the "safe operation of the vehicle in respect to other road users and themselves" (p.182), and secondary tasks include activities undertaken by the driver which do not directly support the driving task. These secondary tasks become distractions when they compete for the driver's mental, perceptual, or physical resources.

From their review, Pettitt et al. (2005) suggest that driver distraction should be discussed in terms of four components: the difference between distraction and inattention; the recognition that distraction can be internal and external to the vehicle; that distraction can be categorised into four types; and the effect of distraction on the driving task. Of particular relevance for the present report, they note that 'distraction' involves "the presence of an event or occurrence that causes a driver to allocate attention, which might otherwise be focussed on the driving task, to a separate activity" (Pettitt et al. 2005:3). They argue that the key point here is that "the result of distraction is inattentive driving; however inattention is not always caused by distraction" (Pettitt et al. 2005:3). They offer a precise and technical definition of driving distraction comprising four components which they codify as *impact*, *agent*, *mechanism*, and *type*.

Driver distraction occurs when: a driver is delayed in the recognition of information necessary to safely maintain the lateral and longitudinal control of the vehicle (the driving task) (**Impact**)…due to some event, activity, object or person, within or outside the vehicle (**Agent**)…that compels or tends to induce the driver's shifting attention away from fundamental driving tasks (**Mechanism**)…by compromising the driver's auditory, biomechanical, cognitive or visual faculties, or combinations thereof (**Type**) (closely adapted from Pettitt et al. 2005:11).

Hedlund et al. (2006:v), reporting after the 2005 Toronto *International Conference on Distracted Driving,* define driver distraction along similar lines but without reference to (requirement for) actual and demonstrable impact on the driving task. They define *distraction* specifically in the following terms:

> *"a diversion of attention from driving, because the driver is temporarily focusing on an object, person, task, or event not related to driving, which reduces the driver's awareness, decision-making, and/or performance, leading to an increased risk of corrective actions, near-crashes, or crashes"*

So it is important to be clear in any definition whether or not distraction must involve some negative impact on driving performance.

Sheridan (2004) for example includes reference to impact on control of the vehicle:

> *"Distraction of the human controller of a highway vehicle is regarded as a disturbance at various points in a classical feedback loop representation of control of a vehicle. The type and locus of the disturbance are the determiners of the vehicle response, as are the frequency and duration of attention away from the driving task. Operationally, if there is no effect of distraction on control, there is no distraction."* (Sheridan 2004:587, emphasis added)

There are some possible problems with such definitions of distraction. For example, it can be difficult to determine just when and how some now-present-element of the driving environment, such as an object, device, event or person *becomes* a distraction, when previously it was not. For example, an interaction with a passenger at some given moment might not be seen as a distraction. However, if the driver at some new moment then turns to face the passenger, and consequently briefly looks away from the road and swerves within or across the lane, or fails to attend to a speed sign, then that same interaction with a passenger, whose actions may have not changed, is now defined as a distraction. This approach places a strict focus on the driver, and the driver's actions and their consequences, rather than the nature and emergence of the distracting element and the circumstances of the driving situation.

Also, it is at least difficult to know, as an analyst, and even as a driver oneself, when attention, however we define that, is actually being 'diverted' or 'allocated' away from driving tasks. This may be apparently obvious for some moments of distraction, for example when a driver looks away from the road and takes a hand off the steering wheel to reach for a mobile (cellular) phone, then presses buttons to make or receive a call, and then holds the phone to the ear to engage in

conversation (cf. Haddington and Rauniomaa, accepted). It may be less obvious however, especially in naturally occurring driving environments as focused on here, when there is no visible evidence that the driver is distracted, or affected by distraction, but nevertheless there is present a distracting element in the driving situation.

The present study does not measure driving performance and control, and does not define distraction in these terms. The focus here is on better characterising the nature and diversity of distractions as they occur as a part of the ordinary natural driving experience. This study sets out to consider, in part, just how in-car elements of the driving situation might indeed be or become distracting.

This study therefore favours a simpler and wider understanding of a distraction as an element of the situation for driving which demonstrably influences the driver's attention to, and participation in relevant driving activities (after Ranney et al. 2000; Stutts et al. 2001). Driving activities include especially looking towards the road or other relevant features of the external or internal (in-car) to conduct or inform driving tasks, and maintaining hand contact with the steering wheel or other relevant driving controls i.e. gear stick or indicator stick, or handbrake. Therefore, a distraction has an impact on driving activities if there is evidence that it, for example, involves the driver looking away from the road ahead, removing a hand from the wheel or relevant other control, re-orienting the body away from the relevant forwards (or occasionally side or even rear) driving activity spaces (e.g. by turning to interact with a passenger), or otherwise visibly attending to something other than driving.

1.3 Sources of distraction

There is not scope here to review fully the now vast research literature on sources of distraction and their impact on driving performance and road safety. Also, there are now already a substantial number of review studies which consider this area (see e.g. Young et al. 2003; Horrey and Wickens 2006; McCartt et al. 2006; Parliament of Victoria 2006; Lee 2008). There is no value in replicating those efforts here. Therefore, this section highlights some key or indicative findings, and for some key areas.

If distraction involves an impact on driving performance of "object, person, task, or event not related to driving", what might these be? Major forms of in-car distraction include the following (see e.g. Stutts and Hunter 2003; Stutts 2005; Parliament of Victoria 2006):

- mobile phones
- entertainment systems
- eating and smoking
- other occupants (front or back seat passengers, including children, pets)
- satellite navigation systems
- climate control systems
- portable electronic devices (e.g. MP3 players, palm pilots)
- laptop computers
- maps, or reading/writing other texts (e.g. diary)
- reaching for or moving objects
- grooming activity

There is growing public awareness of the significance of some of these distractions, especially the use of mobile phones, and there are corresponding laws to regulate behaviour. However, the potential impact on driving and safety of some other distractions is very little understood, and requires further research, especially drawing on data from real-world driving situations.

Importantly, some potential major in-car distractions to driving, especially satellite navigation systems, are too new to have received much research attention at all, and are not even listed specifically in some recent lists of distractions (e.g. Glaze and Ellis 2003, Tasca 2005).

In a US study of accident data, Stutts and Hunter (2003) found that a range of distracting behaviours contributed to accidents, but that the influence of behaviours varied according to driver characteristics, such as age. For example, drivers aged 20 and younger were overrepresented in accidents during which they were adjusting an entertainment system, while drivers 50–64 were overrepresented for being distracted by eating or drinking. Passengers were especially likely to be a distraction for drivers aged 20–29. Interestingly, given the research emphasis discussed below, Stutts and Hunter (2003) found that while mobile phones as a distraction were most prominent among drivers 30–49, they were a small percentage of cases overall.

Stutts and Hunter (2003:43) also conducted an in-car video study to code various distractions as they occurred during driving. Nearly all 70 volunteer drivers were observed to manipulate vehicle controls not directly related to driving (e.g. air conditioning or windows) or were found to reach for objects inside the moving vehicle. Most were also observed to manipulate controls for the entertainment system. About three quarters of drivers ate or drank something while driving or conversed with a passenger, while half of all participants engaged in reading, writing or grooming while the vehicle was moving. About one third of participants used a mobile phone. Stutts and Hunter (2003) found that drivers were engaged in some form of distracting activity about 16% of the total time the vehicle was moving, with different activities occupying drivers for varying amounts of time. For example, for the participants who used a mobile phone, the phone was in use on average 3.8% of the time they were driving.

The following sub-sections report research on specific major sources of distraction.

Mobile phones

Numerous studies have found mobile phone (or 'cellular (cell) phone') use to be a major distraction to driving, and the significance of this influence continues to grow with dramatic increase in mobile phone ownership in recent years. For example, a 2001 US study (cited in Abdel-Aty 2003) found that 54% of drivers usually carried a mobile phone in their vehicle, and 80% of these drivers left the phone on while driving. 73% reported having talked on the phone while driving. In Australia, Horberry et al. (2001) found that 1.5–2% of drivers phoned during measured driving trips. Dragutinovic and Twist (2005:49) report that studies show that drivers who use mobile phones in their vehicle have a four-times higher risk of having a road accident than drivers who do not.

Distraction from mobile phones can involve diverting mental and perceptual attention from driving, and also involve the physical manipulation of the equipment. Using a mobile phone increases response time to events. Concern about the possible distraction caused by mobile phones on driving has led to many studies (see McCartt et al. 2006; Horrey and Wickens 2006; Regan 2006; Caird et al. 2008). These show, for example, how different variables such as age and health or other socio-demographic characteristics relate to and affect the use of mobile phones while driving (e.g. Strayer and Drews 2004; Pöysti et al. 2005; Hosking et al. 2006; Brusque and Alauzet 2008), or how the use of a mobile phone while driving increases the cognitive demand experienced by the drivers (e.g. Barkana et al. 2004). Mobile phone use may also contribute to increased roadway aggression (McGarva et al. 2006). Research has shown that talking on a mobile phone is at least as dangerous as driving while intoxicated (e.g. Strayer 2005; Strayer et al. 2006), and that hands-*free* phones may be no less distracting than hand-*held* phones (Abdel-Aty 2003; Dragutinovic and Twisk 2005; Svenson and Patten 2005; Strayer et al. 2003; Strayer and Drews 2007; see also Jamson et al. 2004). Studies suggest that it is the content or complexity of the conversation or input that best determines the impact on driving (Cooper and Zheng 2002; Amado and Ulupinar 2005). Also, Abdel-Aty (2003) suggests that drivers might engage in longer calls if they do not have to hold the phone to

their ear. The distracting influence of a mobile phone can remain even after termination of the call, leading to errors like ignoring the speed limit (Abdel-Aty 2003).

Recent reviews of the literature have considered the range of studies which investigate the effect of mobile phone use on driving (se e.g. Dragutinovic and Twisk 2005; Svenson and Patten 2005). For example, Svenson and Patten (2005) examine the research evidence for the impact on phone use on perception, cognition, work-load, distraction and road safety. They report on findings from a range of research methodologies, such laboratory studies, simulator studies, field and test track studies, epidemiological studies, and also consider potentially contributing factors such as risk perception and age. For example, phone use impairs a driver's attention to traffic and traffic information, and control of a car becomes less precise and smooth (Svenson and Patten 2005:182). Specifically, mobile phone use "disturbs driving through a diminished field of attention, longer detection times to, e.g., changes in dynamic traffic conditions, longer braking reaction-times to brake lights of preceding vehicles and greater lateral deviations on the road." (Svenson and Patten 2005:195). Drivers may also be inclined to riskier behaviour like accepting shorter gaps or making fewer adjustments to speed or to dangerous road conditions (Dragutinovic and Twisk 2005). Drivers may also miss cues to which they should respond when they are conversing on a mobile phone (Strayer and Johnston 2001).

Passengers

Most driving research and public safety campaigns have focussed on drivers, and comparatively less is known about just how interaction between drivers and passengers impacts driving behaviours. Also, there appear to be many fewer studies examining passengers than mobile phone use, and few studies have examined on-road the effects on driving performance of passengers (see Regan and Mitsopoulos 2001; Gugerty et al. 2004; Drews et al. 2008; Lee and Abdel-Aty 2008; Charlton 2009).

Drivers may be only exposed to conversations between passengers, or may themselves engage in conversation with passengers, and this engagement may or may not involve a bodily orientation to the passenger (e.g. turning to look at the passenger), or drivers may need to interact in some physical way (e.g. to meet a child's needs, to share an object etc.). Passengers can vary in number, location in the car (i.e. front seat, backseat), and with respect to personal and social characteristics. The nature of interaction with passengers can also vary, from ordinary smooth conversation to a heated argument, or maybe dealing with a crying baby or fighting children (Barker 2009). There is some evidence that passengers can have a positive influence on driving (Lee and Abdel-Aty 2008), for example by contributing to or supporting the driving task through sharing their awareness of the driving situation (shared 'situation awareness') (Regan and Mitsopoulos 2001), which passengers might even be trained to do (Mitsopoulos et al. 2005). Passengers might also modulate their contributions to conversation according to the driving situation (Charlton 2009; but cf. Gugerty et al. 2004).

However, simulator research suggests that passengers can have a similar distracting impact on driving as mobile phone conversations, for example for specific driving actions such as contributing to the driver missing an exit (e.g. Horrey and Wickens 2006; Rivardo, Pacella and Klein 2008; cf. Amado and Ulupinar 2005). The University of North Carolina observation study (cited in Parliament of Victoria 2006) found nearly as many instances of drivers distracted by passengers as by phones. Other studies have found that passenger related risk is lower than for mobile phone use, though might contribute more to accidents because of the higher incidence of drivers taking passengers compared to using a mobile phone while driving (McEvoy and Stevenson 2004). Drivers carrying two or more passengers may be twice as likely to crash as unaccompanied drivers (McEvoy and Stevenson 2004). It is thought that particular driver-passenger combinations increase crash risk. For example there is evidence that teenage drivers engage in more risky driving behaviours when a male passenger was present (Simons-Morton, Lerner and Singer 2005), or that

younger drivers with only younger passengers drove less safely (Lee and Abdel-Aty 2008). A New Zealand study found that crashes involve mostly interaction with children (under 13 years old) or teenagers and young adults (see Parliament of Victoria 2006). There is however almost no scientific research of the impact of children on driver distraction (but cf. Barker 2009).

The Parliament of Victoria *Inquiry into Driver Distraction* (2006:86) discusses the findings of key studies from New Zealand and the US. For example, a study in North Carolina found that conversations with passengers accounted for 15.5% of the total time distracted, with another 1% for other distractions relating to a vehicle occupant. A New Zealand study found that passengers were the reported distraction in 12% of 'distraction crashes', while the US Virginia Tech '100-Car study' found that interaction with passengers accounted for 20% of observed crashes.

By examining how distractions occur and are managed by drivers in real-world real-time situations, this study will develop knowledge of how such categories of distraction can co-occur and relate to one another.

Other sources of distraction

In brief, the Parliament of Victoria *Inquiry into Driver Distraction* (2006) discusses the more limited literature on a number of other possible distracting influences on driving, including: eating/drinking; grooming; reaching for an object.

For ***eating/drinking***, the Inquiry notes that a University of North Carolina study found that eating/drinking accounted for 4.6% of total observed driver time. The New Zealand study found that food/drink accounted for 3% of driving related accidents, while a US study found a figure of around 4%. The '100-car' Virginia Tech Transportation Institute Study (VTTI) found that around 7% of distraction-related accidents involved 'dining' (Klauer et al. 2006, discussed in Parliament of Victoria 2006). These studies note that eating/drinking requires more than simply bringing food to the mouth, drivers also search and reach for food, move food, unwrap and open food items, and react to dropped or spilled items. Like mobile phone use, eating/drinking can lead to driving performance errors like lane deviations and failures to observe speed limits. Young et al. (2008) cite research showing finding that snacking at the wheel is a causal factor in more accidents than using a hands-free phone, and in their experiments found that the physical demands of eating and drinking can increase the risk of crashes, especially at moments of greater demand on driving.

Grooming refers to activities such as attending to hair and face, or might include adding or removing clothing items. The University of Carolina study (cited in Parliament of Victoria 2006) found that around 0.4% of time was spent grooming, with a mean duration of around 12 seconds. There is little specific research focus on the impact on driving of grooming, but it is well recognised to be a potentially significant form of distraction.

Like eating/drinking, the potential of ***smoking*** as a distracting influence involves not only the process of coordinating hand and mouth, but also the other preparatory type activities like searching, unwrapping, lighting, as well as monitoring the rate at which the cigarette is burning. Because cigarettes also have the unique feature of being a source of heat/fire, they must be handled differently, more carefully, than say, items of food i.e. it may be more difficult, for example, to put down a cigarette between puffs, than it is to put down an apple between bites. It is likely then that smoking poses different potentials for distracting the driver from primary driving activities. Nevertheless, cars have for many years been fitted with ashtrays, and it is long assumed that people will smoke while driving. Some studies have reported an association between smoking and accidents. The University of North Carolina study noted that about 7% of drivers smoked while driving, occupying 1.6% of their time. The mean duration of smoking activity was long, around 4.5 minutes (cited in Parliament of Victoria 2006). Studies linking smoking to accidents suggest that smoking is a contributing factor in between 1–2% of distraction-related accidents (Parliament of Victoria 2006:90). The New Zealand study noted that half of the accidents relating to smoking

involved reaching for cigarettes, a quarter lighting them, and the remaining quarter involved dropping the cigarette.

Reaching for an object can lead a driver to divert their visual attention from the road, and/or remove the hand from the steering wheel. Objects might include a map, wallet, packet of tissues, sunglasses, payment card (e.g. for highway toll), a toy for a child, or any item a driver keeps in the glove compartment. A driver may even reach down to the floor to pick up an item. Reaching for an object might increase the risk of an accident by between 1.4 and up to 9 times (Parliament of Victoria 2006:92).

2 METHOD

2.1 Research design

The study uses a research methodology new to Australian road safety research, and which has been developed for driving research internationally only very recently. The methodology uses detailed descriptions and analyses of naturally occurring human behaviours and practices, as captured through video recordings. This study therefore focuses on video recorded data of driving behaviours in real-world driving situations. The study examines the diversity, nature and characteristics of in-car distractions and as they occur during driving and can potentially impact driving activities.

The study uses both quantitative and qualitative measures, within a predominantly qualitative ethnographic-inductive research design. The methodology is valuable and appropriate for the research focus and for the current level of real-life data-based knowledge. In particular, in addition to literature review, data collection, quantitative coding and documenting of phenomena, ethnographic oriented observation and description from video recorded data, analysis and interpretation, developing findings and implications, and reporting outcomes.

Specifically, the study collected and analysed video recordings of naturally occurring driving activity, that is, during authentic driving journeys in real-world driving environments. The study took the following analytic approach:

1. Investigators identified moments on the recordings when in-car distractions occurred. Investigators documented the frequency and duration of particular types of distraction, and where relevant noted details of driving activity and the driving situation.

2. Investigators examined selected focus instances of in-car distractions, and these were transcribed and/or described and analysed in micro-detail with regard to their features and real-time occurrence. These analyses therefore examine how drivers coordinate distractions and driving activities, and exactly how distractions impact and can potentially impair driving activities. These accounts therefore provided micro-detailed descriptions of actual driver behaviours, as in-car distractions occur in real-time, and with reference to relevant driving events and external circumstances.

The study therefore complements and develops the range of existing methodologies for researching driving behaviour and road safety. These studies commonly involve driver surveys or interviews (e.g. Beirness 2005; Hatfield and Job 2006), laboratory and simulator studies (e.g. Strayer 2005; Horberry et al. 2006a; Baldock et al. 2007), and crash and database studies (e.g. Glaze and Ellis 2003; Jane and William 2003; Stutts 2005; McEvoy et al. 2005, 2006a, 2006b, 2007a, 2007b). For example, within psychology there is a body of research on driving behaviour (e.g. Dorn and Barker 2005). These studies typically measure driving performance in conintersection with driver and driving variables, such as vehicle speed, driver reaction times to detected stimuli, and the vehicle's lateral position on the road (i.e. staying in lane) (e.g. Horberry et al. 2006b; Harbluk et al. 2007). Research typically concentrates on cognitive behaviour, or might be based on the drivers' reported recollections or attitudes or perceptions, acquired by using questionnaires or interviews (McCarley et al. 2004; Walsh et al. 2007). Most research of mobile phone use while driving is conducted in laboratories or based on interviews rather than direct observation of in-car behaviour in real-world situations.

Moreover, mobile phone or other forms of 'conversation' in experimental situations consist of pre-planned tasks such as giving answers to a multiple-choice or true/false questions, or responding to language stimuli (e.g. isolated or random word prompts), or completing some numerical or other

tasks, rather than actual conversations which are natural and meaningful to the participants (Atchley and Dressel 2004; Gugerty et al. 2004; Kubose et al. 2006; Horrey and Lesch 2008; Ferlazzo et al. 2008). Such 'interactions' might be as brief as 20 seconds. Some studies attempt more closely to approximate real interaction, by having a confederate act as passenger who talks to the driver, however the content or organisation or timing of the interaction will be controlled somehow (McCarley et al. 2004; Drews et al. 2008). For example, the 'passenger' might be required to ensure that turns at talk are distributed evenly (e.g. Strayer and Drews 2004). These studies seek to isolate and examine particular variables, but they can lose the authenticity and dynamics of naturally occurring interaction. Some driving researchers point to the limitations and artificiality of research involving simulated conversations, and the need for caution in generalising to real-life situations, because such conversations may not reflect the nature of real conversation (Shinar et al. 2005; Charlton 2009) or may underestimate its intensity and cost to driving (Horrey and Wickens 2006; Strayer et al. 2006).

In effect, while prior studies establish that mobile phone use has an effect on the driving attention and performance (McKnight and McKnight 1993; Haigney et al. 2000; Törnros and Bolling 2005), as well as help to identify groups of mobile phone users with higher accident risk, there is little basic knowledge of the impact of mobile phone use while driving in general (see e.g. Haigney and Westerman 2001). Existing research has been important for understanding, for example, driver perceptions, or statistical patterns and likelihoods, or the effect of one known variable on another, and has enabled researchers to target and respond to particular identified issues, relating to known psychological concepts, for example measures of cognitive or workload demand (McCarley et al. 2004).

The potential value of using direct observations of driving was noted and called for at the first *International Conference on Distracted Driving* (Hedlund et al. 2006: vi), held quite recently in late 2005 (see also Haigney and Westerman 2001). However, relatively few studies examine driving distractions through in-car video data of real-world driving situations. Video-based studies allow for close analysis of driver behaviour. This study meets calls for such studies by drawing on expertise in the micro-detailed analysis of video data for naturally occurring behaviours, including communication and interaction in cars. Road safety researchers with special interest in distracted driving have explicitly noted that "[e]ffective strategies to reduce the causes or risks of distracted driving will require interdisciplinary thinking" (Hedlund et al. 2006:viii).

The present study can build on previous research which has emphasised classifying distractions and monitoring how much time while driving was consumed by each distraction (Stutts et al. 2003; Dingus et al. 2006). It responds to and advances research methodologies in the field by investigating exactly how in-car distractions occur and impact driving activities. This study can provide detailed descriptions and analyses of the nature of distracted driving, occurring in real-time real-world driving. These descriptions and analyses can help identify points of interest and variables, and how they might be characterised and investigated, for future research.

- How do drivers either initiate distractions themselves, or react to distractions when they occur outside their control?
- How do drivers coordinate their management of in-car distractions with the real-time activities for driving? (e.g. manipulating vehicle controls, attending to relevant events of the external driving environment)
- What are the detailed *in situ* features of in-car distractions? i.e. what do in-car distractions look like, and how do they play themselves out, in real-time real-world driving?
- How do in-car distractions occur and develop relative to one another?

This study addresses the above questions by examining distraction and coordination of driving activities as part of the ordinary experiences and demands of real-life driving. It does not measure or assess driving performance and its relation to distractions.

2.2 Methodology

This study's particular innovation and contribution is to draw on the researchers' expertise in methodological fields which involve, most directly, the micro-detailed transcription and analysis of recorded behaviours and practices, using naturally occurring data, to examine conduct in actual real-world settings. Most significantly, the study is grounded in two fields within sociology, *conversation analysis* and *ethnomethodology* (see ten Have 2004, 2007), and also *gesture studies* (e.g. Kendon 2004), and also draws on investigators' awareness and experience of *ethnographic participant observation* (e.g. Calvey 2003; Carlin 2003; for introductions see Atkinson et al. 2001; Bryman 2004; Silverman 2005) and *multimodal interaction* (e.g. Jordan and Henderson 1995; Norris 2004).

Researchers worldwide have for over three decades conducted qualitative micro-detailed studies of video recordings of behaviours in real-life situations, across a huge range of settings for conduct and interaction (especially including spoken interaction). These settings include interaction between health professionals and clients (e.g. Robinson 1998; Robinson and Stivers 2001; Heritage and Maynard 2006; Nishizaka 2007), including surgery and medical work (e.g. Mondada 2003; Koschmann et al. 2007), professional and team work (e.g. Lynch et al. 1990/1983; Goodwin 1995, 1996; Murphy 2005; Mondada 2006, 2007b), courtrooms and police work (e.g. Goodwin and Goodwin 1997; LeBaron and Streeck 1997; Kidwell 2006), and educational settings (e.g. Rendle-Short 2006). These studies use micro-detailed transcriptions and descriptions to see precisely how people moment-to-moment successfully organise and undertake relevant activities and accomplish setting-specific tasks and goals. Such research emphasises the value of studying and understanding human behaviours, not pre-theorised but in their own terms, as involving the complex coordination of simultaneous activities within dynamic contexts.

The present study adds to only a handful or so of very recent studies in this field that have conducted such video based micro-detailed investigations of real-world behaviours *in cars*. For example, key studies include Laurier (2004, 2005, 2006), Laurier et al. (2007, 2008), Brown and Laurier (2005), Mondada (2007a), Haddington and Keisanen (2009), Haddington (2010), Nevile (in press, 2011), and a collection edited by Haddington et al. (in press, 2011). There are also related studies for other forms of transport such as commercial aviation (Nevile 2004a, 2004b, 2007). So far these studies on cars have not focussed on matters of road safety and so have had no particular interest in distraction or factors which can potentially negatively impact on driving. Instead, a strength of this research direction is its focus on the actions, language and embodied practices of social interaction within the physical and spatial configuration of the car or other vehicle as a mobile setting, as well as how the semiotic environment through which people move constrains or affords particular interactional practices, social activities and understandings. Such research has begun to consider driving not as an individual and primarily cognitive activity, but as situated and socially accomplished.

For example, these studies have examined the following:

- driving as a situated practice (Laurier 2006, Laurier, et al. 2008; Nevile in press)
- how people organise and coordinate driving and work simultaneously (Laurier 2004)
- how drivers search for parking places (Laurier 2005)
- how people use maps in cars (Brown and Laurier 2005)
- how people navigate and negotiate routes and destinations (Garfinkel 2002; Haddington 2010; Haddington and Keisanen 2009)
- how stops on a journey are identified, communicated and negotiated (D'hondt 2009)
- how people use mobile technology while driving (Esbjörnsson et al. 2007).

The present study joins this research direction by focussing on distraction and its impact on driving activities.

2.3 Collecting data

Data consist of approximately 27 hours of video recordings of driving during ordinary authentic real-world journeys. Journeys varied in length from 4:27 (4 minutes: 27 seconds) to over an hour (1:21:03). Journeys were recorded mostly within the greater Canberra area. One recording was made during a trip from Canberra to Sydney, some other journeys were to towns and locations outside Canberra.

Participants

Drivers were recruited through word of mouth from within the wider university community and through circles of acquaintance. Drivers were asked to volunteer for the study (see further details below) or expressed to the lead investigator their interest to be involved.

Some recorded journeys also included passengers. Adult passengers completed a consent form, and for child passengers consent was obtained from their parents.

Camera set up

Video data was collected by mounting discretely two cameras within the car: one on the dashboard facing rearwards; the other at the rear facing forwards. In Figure 1 below the positions are indicative of the positions used (see also Figure 2). Participants were trained by investigators on how to mount and operate cameras for recording in their own vehicles. Participants were then responsible for all filming, conducted independently of the investigators.

Cameras used were two identical digital handheld camcorders, the Canon HF11. Each camera was fitted with a wide angle lens converter. The camera placement technique has been used successfully by other researchers (e.g. Laurier 2005; Mondada 2007a), and including by study co-investigator Haddington in Finland (Haddington 2010; Haddington and Keisanen 2009). The *first camera* was placed on the dashboard and captured the driver's actions, and in most cases also the actions of the front seat passenger. This camera also captured some details of the external driving environment as visible through the rear window. The view of rear seat passengers was usually limited, mostly obscured by the front seat. The *second camera* was placed at the rear of the vehicle facing towards the front seat occupants and the centre instrument console. This view could capture drivers' activities from behind, and particularly the driver's contact with climate control systems, entertainment controls and devices (e.g. connected MP3 players), and any other front seat accessible items. The second camera also allowed capture of some detail of the driving environment through the side windows and the windscreen. The second camera usually provided also a second view of the front seat passenger.

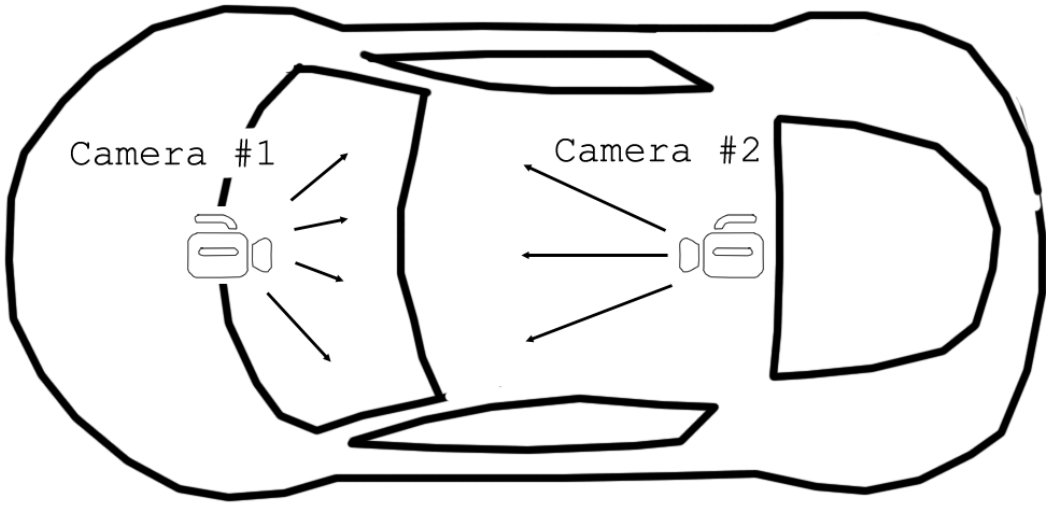

Figure 1: Layout of the camera positions in cars

Figure 2: Two images showing the camera positions (front and rear) in the recording situation (left hand drive setup in Finland)

For authenticity, recordings were made in participants' own vehicles, and so recorded data was collected from a range of vehicle types (including sedan, wagon, hatch) and vehicle brands (including Mazda, Volvo, Mitsubishi, Lexus, and two models of Toyota). The recordings were therefore affected by variation in design and layout for different vehicles.

The primary aim was always to direct the camera to capture the behaviours of the driver. For example, in some vehicles for journeys with a front seat passenger only partial view of the passenger was possible, and so it was not possible to capture or track all the passenger's movements. This occurred for example in vehicles with one or more of the following features: a steep sloping windscreen; a shallow dashboard; a slightly slanting dashboard; a dashboard with rising (e.g. curved) surfaces making space for displays. In these cases the camera could not be placed far enough back to allow a wide-enough shot to capture both driver and all the front seat passenger. In most recordings the front (rear facing) camera's view of passengers was not complete.

The view of rear seat passengers was usually obscured by the front seats. However, recordings were able to capture some activities of rear seat passengers, especially when these related to front seat occupants (e.g. passing objects). Recordings also generally captured conversations involving all passengers. Sometimes some driving activities could not be captured, for example the driver's right hand, or braking activity. Braking activity could be inferred by evidence of visual cues from the external environment or by changes in engine sounds.

2.3.1 Summary of data

Table 1 below summarises data collected in Australia specifically for the study, and coordinated by the lead author (Nevile). The Australian data consists of approximately 27 hours of video recorded data and from 90 journeys. This amount of data is more than ample for the study's aims and emphasis on qualitative micro-detailed analyses of distractions in naturally occurring driving situations. Such micro transcription and analyses of human activity is very labour intensive and time consuming, but is rewarded with extremely rich data.

Note however that in addition to these Australian recordings the qualitative analyses, which form the distinctive contribution of this study, draw on recordings from projects in Finland (led by co-investigator Haddington), and in the UK (led by Dr Eric Laurier). The study as a whole therefore represents journeys undertaken by a further 7 drivers, making a total of 16 drivers.

Table 1: Data Summary: representing only data collected in Australia, excluding data from Finnish and UK projects

Participating drivers		**Number and duration of journeys (hours:mins:seconds)**	
Total =	**9**	Total journeys =	**90**
Male =	**6**	Total hours =	**approx. 27 hours**
Female =	**3**	Shortest journey =	**00:4:27**
		Longest journey =	**1:21:03**
		Average journey =	**approx. 00:18**
		By Male drivers =	**49 journeys; total approx. 15 hours**
		By Female drivers =	**41 journeys; total approx. 11.5 hours**

The quantitative results for the study report findings from the nine drivers recruited for driving recordings in Australia, as outlined in Table 2 below. The project had sought to have ten drivers, and to have a balance of experienced (>5 years driving experience) and novice drivers (<5 years driving experience). However, given the scope and time constraints of a small and short one-year study, and especially some delays in commencing the project and data collection phase, it was not possible to recruit this intended population of drivers. Also, each driver used both of the two available cameras and so only one driver could participate at any one time, and some drivers took longer than expected to return the cameras .

Table 2: Details of data recordings according to each participating driver

Driver	Driver	Gender	Driving level	Journeys	Total recorded hours
1	Elder Male (>65 years old)	M	Experienced	2	2:08:
2	Female A	F	Experienced	27	7:42
3	Female B	F	Experienced	4	:45
4	Female C	F	Experienced	10	3:08
5	Male A	M	Experienced	29	8:11
6	Male B	M	Experienced	6	1:21
7	Male C	M	Experienced	2	:28
8	Younger Male (<25 years old)	M	Novice	4	:51
9	Male D	M	Experienced	5	2:02

Table 2 shows that drivers varied widely in terms of the amount of data collected. This is a not a problem because the study's emphasis is on qualitative analyses, and is not attempting to produce generalisable quantitative results.

Drivers were asked to collect around three hours of data each, but individual preferences, driving journey patterns, practical issues for recording (camera set-up), and the study's time constraints, made this too difficult to achieve for six of the nine drivers. This is because the study sought naturally occurring data, everyday journeys, and so drivers typically recorded their journeys to work, or to take children to various commitments (school, sport), or for trips to the shops. Also, most of the recordings were made within the Canberra area, where distances are short and journeys are often quite brief. Therefore, it was difficult for many drivers to accumulate a sufficient number journeys to make the three hours. The average journey time across all drivers was around 18 minutes.

So, given the primary qualitative focus of the study on the situated and temporal nature and development of distracted driving, the investigators decided that it was valuable to seek a high total amount of recorded data (final total approx. 27 hours) and a high number of individual journeys (n=90).

Nevertheless, we can note that six of the nine drivers contributed over an hour of data, with five of those drivers contributing over two hours each. All drivers contributed at least two journeys, and seven of the nine drivers contributed four or more journeys. Three drivers made ten or more journeys. Two drivers found the recording process relatively easy and collected over seven and eight hours respectively, totalling over half of the journeys and total hours recording for the data collected in Australia. One female driver collected just 45 minutes of recording, and one male driver contributed 51 minutes, but in each case these totals represented 4 journeys. One driver made two average length journeys and then returned the cameras after deciding that the set-up and recording task was too inconvenient.

Ethics

The study was conducted according to standards and procedures approved by the Australian National University research ethics committee. Full ethics documentation is provided in Appendix

A. Participants' consent was obtained to be filmed, either while driving or as a passenger, and for how the recorded data could be used for research purposes. Participants were informed that they could withdraw from the study at any time without explanation, and could withdraw consent for their data to be used. To ensure authentic data, subjects were initially given only a general description of the research study as concerning the nature of ordinary driving, and were told that the title of the study was *Investigating ordinary driving activities.* This approach reduced the possibility that subjects would become conscious of and modify their driving behaviours (or behaviours as passenger), and especially their behaviours relative to distractions. After data collection participants were then given a de-briefing sheet identifying the actual interests and title of the study, and explaining its focus on distraction in driving. Subjects were asked to confirm their consent for the study to use their recorded data for research purposes. No participants chose to withdraw their involvement in the study, or to withdraw consent for their data to be used.

Participants' permission was obtained to use the collected video recordings strictly for research purposes, and participants were asked to indicate where and in what circumstances their data could be used. Participants' were assured that their identities would remain anonymous, and were asked if (and how) they wished their facial features to be made anonymous in any public research use of excerpts from recordings or stills from recordings. For example, identifying facial details can be easily disguised through blurring or pixelation, or through conversion of video stills to line sketches. This technique has been used in previous similar studies using video based data, including by the lead and partner investigators of this study. For example, the lead investigator Nevile has for many years worked with highly sensitive video of airline pilots at work on actual regular passenger flights. Co-investigator Haddington is the lead investigator for the *Talk&Drive* funded project in Finland, which has collected and analysed in-car video recordings to examine social interaction in cars. Some studies in driving safety research have also collected video data, filming either within the vehicle or from some outside vantage point such as an intersection (Stutts et al. 2003; Strayer 2005). For the present study all subjects have requested that use of their data preserves their anonymity.

Video filming did not impact on drivers or their ordinary driving activities. This is important for safety and for reasons of data authenticity. The lead investigator (Nevile) has dealt with the demands of filming naturally occurring conduct in confined settings in his experience researching airline pilots at work, for which he sat and filmed in the cockpit, directly behind the pilots, on 18 regular passenger flights (see Nevile 2004a, Nevile 2004b). Co-investigator Haddington has also addressed such issues when collecting video data for studying interaction and activity in cars in Finland.

2.4 Analysing data

The video recorded data was examined by the two investigators (Nevile, Haddington) and two research officers engaged for the study.

For data collected in Australia specifically for this study, the *first stage of analysis* was conducted by two research officers and the lead investigator (Nevile). This stage involved viewing recordings to identify and note all possible moments of distraction and any distracting elements of the driving situation. This analysis stage was informed by existing research on known sources of distraction. However, the investigating team was also open to the possibility of finding new sources of distraction, or subtleties in the nature of distractions, or particular combinations of distractions, or details for how distractions related to driving activities.

A data sheet was developed for each trip, on which was detailed the following:

- general information about the circumstances of journey, the driver, and others in the vehicle (e.g. driver's experience level (novice vs experienced), number of passengers, status and

relationships between passengers (e.g. father and son, woman and mother, man and partner)
- the start and end time of each journey
- each distraction as they occurred in chronological order for the progress of the journey
- for each distraction: the source of distraction, the time of occurrence, the duration, any relevant details of the circumstances of driving or the external driving environment.

A *second stage of analysis* involved examining the data sheet for each journey and summarising results for the various sources of distraction. Then results for all journeys for all drivers were collated to generate quantitative results representing the whole participant sample. These are presented in section 3.1.

A *third stage of analysis* involved identifying a select group of instances of in-car distraction for detailed microanalysis by the co-investigators. This analysis would provide more precise understandings of the diversity, nature and features of distractions, and how they originate, develop, and are responded to by the driver and passengers. These instances were described and/or transcribed from the video recordings and analysed in micro-detail with regard to their real-time occurrence. These analyses allowed for extensive examination of, for example, how in-car distractions occur relative to driving activities, how drivers coordinate distractions and driving activities, and exactly how distractions potentially impact driving activities. These analyses therefore provide micro-detailed descriptions of actual driver behaviours, as in-car distractions occur in real-time, and with reference to relevant driving events and external circumstances.

Detailed analyses could examine visual details of the following:

1. the source, type and in-car location of the distraction
2. the features of the distraction
3. the driver's response to and/or management of the distraction
4. the timing and duration of the distraction
5. how the distraction relates to driving activities, and to circumstances of the external driving environment
6. the ease of returning to driving activities
7. how the distraction impacts and potentially impairs driving activities.

The detailed analyses of select instances of in-car distraction would reflect the range of possible sources of in-car distractions.

2.5 Summary of methods

The study :

- drew on specific expertise in the micro-detailed transcription and analysis from video recordings of naturally occurring real-time activities and behaviours
- collected and analysed naturally occurring data - video recordings of driving activity in real-world road situations
- identified and documented occurrences of in-car distractions for compiling quantitative measures (e.g. type and timing)
- analysed in precise micro-detail the details of selected sample of instances of in-car distractions, and their impact on driving activities.

3 RESULTS

3.1 Quantitative results

This section presents *quantitative* results for the video recorded data. It is very important to note that data for the quantitative analyses are drawn *only from the video recordings collected in Australia.* The qualitative analyses presented later draw also on data collected for projects conducted in Finland (led by co-investigator Haddington) and the UK (led by Eric Laurier, who has generously given permission for their use here).

Limitations

The principal focus of this funded study is to examine the nature and occurrence of in-car distractions and their impact on driving activities. The particular strength and contribution of the project is that it provides detailed micro-analyses of instances of actual distractions as they occur in real-time during real-world journeys. These analyses are presented next in section 3.2. Due to this focus the recordings collected in Australia represent a very limited sample of individual drivers (n=9).

Therefore and importantly , there is not scope, and the study does not seek, to present comprehensive, representative, and generalisable quantitative findings on the occurrence of particular distractions, or their occurrence relative to characteristics of drivers, passengers or journeys, across the population beyond this study. The results here are intended to be indicative only for the small sample of drivers recruited for this study. However, one possible strength of the quantitative findings is that they represent a significant number of separate journeys (90), and total hours of recordings for real-life driving situations (27 hours). The data are also revelatory of the possibilities for identifying the normal behaviours of individual drivers.

3.1.1 Driver Behaviours

The following table outlines the overall occurrences of different sources of in-car distraction observed in the video recorded data of ordinary real-life journeys, and also the number of journeys in which the distraction occurred.

Tabulated data and discussions below are intended to highlight significant features of the quantitative results.

Table 3: Summary of distractions representing driver behaviours

Driver behaviour	No. journeys	% of journeys
Talking*	46 / 46*	100%
Grooming	82 / 90	91%
Adjust entertainment system	52 / 90	58%
Search for objects	40/ 90	44%
Singing / drumming	36 / 90	40%
Adjust climate control	27 / 90	30%
Eat / drink	7 / 90	8%

Driver behaviour	No. journeys	% of journeys
Make mobile call	6 / 90	7%
Text – on mobile phone	4 / 90	4%
Receive mobile call	2 / 90	2%
Read	1 / 90	1%

* (Passengers were present in 46 of the 90 journeys, 51%)

Talking with Passengers

In 46 of the 90 journeys, the driver was accompanied by at least one passenger. In all of these journeys there was some talking between the driver and passenger (100% of journeys with passengers).

Data in this section relates to time where driver and passengers talked. Data on passengers talking amongst themselves (without participation of the driver) will be covered below.

There are some inherent limitations in generating quantitative results for incidents of in-car conversation, although data for total duration of conversations is generally reliable. For example, it is difficult to determine definitively, without micro-transcription and analysis, when a particular 'conversation' starts and finishes, or who 'initiated' the conversation (i.e. the driver or passenger). As some later qualitative analyses here show, real conversation can be highly complex in its nature and development. At best, it might be possible to say that in 3 of the 46 journeys it appears the conversations were initiated by the passenger only, and in 2 of the 46 journeys the conversations were initiated by the driver only. In all other journeys it appears that conversations were initiated by both the driver and passenger together, and that drivers were just as keen to talk as passengers (with the exception of one journey, a 1 hour 21 minute journey, where most of the talking was done by the front passenger who was reading a newspaper out loud to the driver).

Time in conversation between driver and passengers ranged from 0:15 to 22:42 (while in one journey talk lasted 36 minutes 24 seconds, this was mostly the front passenger reading the newspaper out loud). The longer the journey the longer the conversation can potentially endure, but in data here it does not appear that journey length is directly related to time spent in conversation. For example, the journey with 0:15 spent in conversation lasted 12:25 – while in other journeys of similar length the time spent in conversation ranged from 5:15 to 11:10 (in journeys between 11:00 and 13:00).

Given that journey duration times varied widely in journeys with passengers (from 5:20 to 31:43 with one journey being an outlier at 1:21:03), duration of time spent talking is not meaningful on its own. The report therefore presents the percentage of the journey time spent where driver and passenger conversed.

Percentage of journey time spent with driver and passengers talking ranged from 2% to 100%, however, in 41 of these journeys percentage of time spent talking ranged from over 30% to 100%. Also, in 32 of the 46 journeys, time spent talking ranged from 50% to 100% (making the 2% of time talking journey an outlier) (see Table 4 below).

The average percentage of time talking was 58.6%, or 59.9% (excluding, as an outlier, the journey with 2% of time talking).

Table 4: Talking with Passengers

% of journey time talking	No. of journeys	% of journey time talking	No. of journeys
2% - 27%	5	2%	1
		10%	1
		13%	1
		21%	1
		27%	1
> 30% - < 50%	9	>30% and < 40%	3
		>40% and < 50%	6
> 50% – 100%	32	>50% and < 60%	10
		>60% and < 70%	7
		>70% and < 80%	7
		>80% and < 90%	4
		> 90% and < 100%	2
		100%	2

In the 2% outlier journey, the driver initiated 2 conversations (one lasting 0:02, the other 0:13). This journey lasted for 12:25 and was largely uneventful except for the driver adjusting the camera on the dashboard several times. The driver was an adult male, and the passenger was a teenage male.

In journeys with one passenger

In 37 of the 46 journeys with passengers there was only one passenger (plus two journeys with one human passenger and one dog, which are treated separately).

In four (of the five) journeys where the percentage of time talking was less than 30%, there was one passenger.

In journeys with more than one passenger

There was more than one passenger in 9 journeys. With such small numbers we cannot make many inferences from the data, however, in all these journeys bar one, talk time (where driver was engaged in conversation) was more than 45% of the total journey time. Also, in five of the nine journeys the percentage time talking (where driver was engaged) was more than 50% - so it can be inferred that the presence of more than one passenger makes for talkative journeys.

In one of these journeys, the percentage of time where driver was engaged in conversation was only 27%, but there were also periods in the journey where the passengers were engaged in conversation amongst themselves, but the driver did not become involved (see section 'Passenger Behaviours' below).

Other forms of 'passenger'

Two of the journeys (with one passenger) included a dog as an extra 'passenger'. The dog's presence developed as a distraction, as is discussed in detail in microanalysis Example 11. The dog fell off the rear seat during a turn, and this drew the attention of both driver and front seat passenger, and became the subject of conversation. In two journeys with no human passengers there

was a dog in the back of the car (a station wagon?). During both journeys the dog was quiet and well behaved and there was no incident, and so the dog did not appear to be a distraction.

Grooming

Grooming appeared to be a very commonly occurring source of distraction. Grooming occurred in 82 out of 90 journeys (91% of journeys). After talking to passengers (in journeys where passengers were present) grooming is the most common distraction. Grooming was interpreted to include any activity involving attending to or adjusting some feature of the body, including clothing and bodily related objects. Grooming therefore included the following activities: scratching or rubbing, adjusting hair, adjusting glasses, adjusting clothing, applying makeup or moisturising lotion, or using a handkerchief. Some instances of distraction selected for qualitative microanalysis are evidence of grooming (see within section 3.2).

Frequency per journey of grooming activities ranged from just once to 29 times (with one clear outlier, a journey of 1 hour 20 minutes with no passengers, where the driver groomed 87 times for 3:12). However in the great majority of journeys grooming occurred between 1 to 17 times (see Table 5 below).

Table 5: Grooming

Frequency of grooming activities per journey	No. of journeys
1	4
2	7
3	3
4	5
5	7
6	5
7	5
8	7
9	4
10	3
11	4
12	4
13	3
14	5
15	2
17	4
18	1
19	1
20	1
21	1
23	1

Frequency of grooming activities per journey	No. of journeys
24	1
27	1
29	2
87	1

Duration of journey does not appear to affect the frequency of grooming activities. For instance, in journeys of 17:20 and 17:32 the driver groomed only once, and for just one second, whilst another driver in a shorter journey of 13 minutes groomed 29 times, for a total of 1:20.

The amount of time spent on grooming activities ranged from 0:01 to 3:12, though in 75 out of 82 journeys where the driver groomed, time spent grooming was less than 1:00, and in 64 of the 82 journeys time spent grooming was less than 0:30. Durations from 1:20 to 3:12 appear to be outliers as they only make up four out of the 82 journeys, and if excluded from the calculation, are well above the average duration of 0:19 (this calculation is based on the 78 journeys between 0:01 – 1:09) (see Table 6 below).

In the journey where the driver spent 2:33 grooming, the driver was applying moisturising lotion to her hands, face and arms. This instance of distraction is discussed in substantial detail in the microanalysis Example 5. The analysis shows that a notable detail of the occurrence is that the 2:33 time spent grooming was actually spread over a much longer period of many minutes, and with many changes in driving circumstances.

Table 6: Time spent grooming per journey

Time spent grooming per journey (in min:sec)	No of journeys	No of times groomed
Between 0:00 – 0:10	26	Between 1 – 8 times
Between 0:11 - 0:20	25	Between 2 – 17 times
Between 0:21 – 0:30	14	Between 4 - 19 times
Between 0:31 – 0:40	3	Between 17 – 24 times
Between 0:41 – 0:50	5	Between 10 – 27 times
Between 0:51 – 1:00	3	Between 11 - 13 times
Between 1:01 – 1:10	2	17 times and 29 times
1:20	1	29 times
1:56	1	17 times
2:33	1	23 times
3:12	1	87 times

Results here suggest that there may be a relationship between the number of times the driver grooms, and the total time spent grooming per journey (Table 6 above).

Adjust entertainment system

In 52 out of 90 journeys the driver adjusted the entertainment system (58% of journeys), making it the third most common distracted behaviour observed.

The number of times the driver adjusted the entertainment system per journey ranged from one time to 10 times.

Though a common activity, the number of instances per journey where driver adjusts the entertainment system is low, as in half these journeys (26 out of 52) the driver adjusted the entertainment system only one or two times.

In 45 out of 52 journeys, the driver adjusted the entertainment system between one and five times, and in seven of these 52 journeys, they adjusted it between 6 and 10 times (see Table 7 below).

Table 7: No of times driver adjusts entertainment system

No. of times driver adjust entertainment system	In no. of Journeys
1	**13**
2	**13**
3	8
4	4
5	7
6	1
7	3
8	2
9	0
10	1

The duration of time the driver spent adjusting entertainment system ranged from 0:01 to 1:23 (though this latter journey – journey 85 – lasted one hour and twenty minutes). In 48 out of 52 journeys the duration was 0:15 or less, and in 41 out of 52 journeys the duration was 0:10 or less. Journeys where duration spent on the activity was more than 0:15 (4 out of 52 journeys) appear to be unusual (see Table 8 below).

Table 8: Time spent adjusting entertainment system

Time (in min:sec) spent adjusting entertainment system	No. of journeys
0:01	**10**
0:02	**9**
0:03	2
0:04	6
0:05	1
0:06	2
0:07	4
0:08	4
0:10	3

Time (in min:sec) spent adjusting entertainment system	No. of journeys
0:11	2
0:12	1
0:14	1
0:15	3
0:19	1
0:23	1
0:32	1
1:23	1

Search for object

Drivers searched for objects in 40 out of 90 journeys (44% of journeys).

Journey durations where driver searched for object ranged from 4:27 to 1:21:03.

The number of times per journey that the driver searched for objects ranged from 1 time to 6 times, but for one long journey (of 1:20:42 duration) where the driver searched for an object 16 times. Despite this, there does not appear to be a strong relationship between the number of times a driver searches for an object and the length of the journey, as in the longest journey (with a duration of 1:21:03), the driver only searched for an object three times, while in three out of the 8 journeys that lasted more than 30 minutes the driver only searched for an object once. Once is by far the most common number of times that the driver searched for an object (in 20 out of 40 journeys) (see Table 9 below).

TABLE 9: No of times driver searches for objects per journey

No. of times search for object	No of journeys
1	**20**
2	7
3	4
4	3
5	2
6	3
16	1

Time spent searching for objects varied widely, from 0:01 to 2:25.

There does not seem to be a strong relationship between number of times the driver searched for an object and the duration of searching. For example, in journeys where the driver searched for an object once, durations ranged from 0:01 to 0:40 (for one search). Duration range also varied widely in the journeys where the driver searched for an object 6 times (from 0:31 to 2:25). In these journeys the average time spent per search ranged from 5 seconds per search (for the journey searching for 0:31), to 32 seconds per search (for the journey searching for 3:12).

TABLE 10: Time spent by driver searching for objects

No. of times searched for object	Duration range
1	0:01 – 0:40
2	0:05 – 0:51
3	0:09 – 3:12
4	0:07 – 0:25
5	0:31 – 0:41
6	0:31 – 2:25
16	2:58

Although time spent searching for objects varied between 0:01 and 3:12, generally drivers spent very little time on this activity. In 36 out of the 40 journeys where the driver searched for objects, they spent less than one minute on this activity. In 29 of the 40 journeys where the driver searched for objects, they spent less than 30 seconds searching for objects (see table 11 below).

TABLE 11: Time driver spent searching for objects

Time searching	No. of journeys	Time searching	No. of journeys
Less than 1 minute	36 Journeys	0:01 - < 0:10	18 journeys
		> 0:10 - < 0:20	4 journeys
		> 0:20 - < 0:30	7 journeys
		>0:30 - < 1:00	7 journeys
More than 1 minute	4 journeys	> 1:00 - < 2:00	1 journey
		> 2:00	3 journey

In 23 out of 40 journeys where the driver searched for objects there were no passengers (57.5%) and in 17 out of 40 there was at least one human passenger in the car (42.5%). On the surface this would indicate that passengers did not appear to influence whether or not a driver searched for objects. However, the microanalyses provided in this study document indicate instances where passengers did influence driver searching behaviour. This is interesting because it opens up the possibility for further investigating such instances. For example, how do passengers assist or influence the search for objects? Do drivers request passengers' help or do passengers initiate the activity, and if so, how? How does the searching activity begin, and what occasions it?

Responding to music: sing / drum / move to music

In 36 out of 90 journeys, the driver sang or drummed (that is, tapped hands on the steering wheel or steering column) to music playing on car entertainment system or portable MP3 player. This was therefore a common activity (40% of journeys), and is evidence of the driver attending to something other than driving.

In terms of responding to music, singing or drumming were by far the most common activities, though in a small number of journeys the video transcribers noted that the driver also visibly moved in time to the music, or whistled as well.

It is difficult to determine reliable data for counting the number of times the driver sang/drummed during the journeys, because of differing methods in counting the activity – for example the driver may sing along to the chorus of a song, then stop during the verse, and then sing to the chorus again. Is the driver singing once, because it is one song, or is the driver singing several times by stopping and starting?

Duration for the activity of responding to music ranged from one second to 7:10, though in 26 out of 36 journeys, the duration was less than 1:00, and in 15 out of 36 journeys the duration was less than 0:10 (see Table 12 below).

Table 12: Duration of singing / drumming etc to music

Duration singing / drumming (in min:sec)	No. of journeys *
< 0:10	**15**
< 0:10 and > 1:00	**11**
< 1:00 and > 2:00	3
< 2:00 and > 3:00	3
< 3:00 and > 6:00	1
> 6:00	2

* There is one journey where the duration was not recorded in the transcription log.

One driver (Female A) was the driver in the six journeys where singing duration was for more than 2:00. Female A was also the driver in 18 out of the 36 journeys where the driver sang/drummed. Therefore, the data are weighted to reflecting the conduct of this individual driver.

Journey duration does not appear to affect the time spent singing/drumming. For example, the shortest journey duration where the driver sang/drummed was 8:26 (the driver sang for 2:23), while in the second longest journey (31:43), the driver sang/drummed for 2:47.

Adjust climate control

In 27 out of 90 journeys, the driver adjusted the climate control (30% of journeys).

Journey durations where the driver adjusted climate control ranged from 4:27 (with two adjustments) to 1:21:03 (with 4 adjustments). In the second longest journey (of 1:20:42) the driver only adjusted the climate control twice, and the journey where the driver adjusted the climate control the most (7 times) was a relatively short journey of 17 minutes. This would indicate that journey duration does not necessarily affect the frequency for the driver to adjust the climate control.

Adjusting climate control is a relatively infrequent activity, as in 13 out of the 27 journeys where the driver adjusted the climate control they did so only once. In 8 out of the 27 journeys the driver adjusted the climate control twice, and in four journeys the driver made 3 adjustments. In one journey the driver adjusted the climate control 7 times, but this appears to be an exceptional case (see Table 13 below).

Table 13: Frequency per journey the driver adjusted the climate control

Frequency driver adj. climate control	No. of journeys
1	**13**
2	**8**
3	4
4	1
7	1

The journey where the driver adjusted the climate control seven times lasted for 17:00. Thirteen of the 27 journeys lasted between 17:00 – 1:21:03, and in these journeys the driver adjusted the climate control between one (in five journeys) and four times (one journey), indicating that journey duration does not necessarily affect the frequency for adjusting the climate control.

Time spent adjusting climate control is very minimal (between 0:01 – 0:19), but most commonly only takes one or two seconds (in 14 out of 27 journeys) (see Table 14 below).

Table 14: Duration (in min:sec) for driver's time spent adjusting climate control

Duration adj. climate control (min:sec)	No. of journeys
0:01	**7**
0:02	**7**
0:04	2
0:05	4
0:07	1
0:08	1
0:09	3
0:10	1
0:11 – 0:18	0
0:19	1

Single incidents of adjusting climate control are usually very short in duration. For journeys where duration spent adjusting climate control was more than 4 seconds, the duration time can be divided by the number of times the driver adjusted climate control. This makes it possible to determine the range (see Table 15 below). Time ranged from between 0:01 and 0:05.

Table 15: Duration for adjusting climate control

Duration time (min:sec)	Divided by no. of times	= average duration (rounded up to nearest second)
0:04	2	0:02
0:04	2	0:02
0:05	1	0:05
0:05	1	0:05
0:05	2	0:03
0:05	2	0:03
0:07	3	0:02
0:08	3	0:03
0:09	2	0:05
0:09	3	0:03
0:09	4	0:02
0:10	3	0:03
0:19	7	0:03

Passenger Influence

In 11 out of the 27 journeys where the driver adjusted climate control there were passengers, and in 16 journeys there were no passengers, indicating that presence of a passenger does not appear to influence the driver adjusting climate control. Interestingly though, this finding also suggests that drivers commonly do not request passengers to use or adjust the climate control system.

Mobile phones

While much of the driver distraction literature centres around mobile phone use as a distraction, drivers in this study rarely used mobile phones, and usually only for very short durations.

In six out of 90 journeys, the driver made a mobile phone call. Mobile phone calls were made by only two of the nine drivers (Female A made two calls in one of her journeys, while Female C was the driver in the other 5 journeys where a mobile call was made).

- Female A made two mobile calls, with a total duration of 0:42.
- Female C made one mobile call in two journeys, and two mobile calls in the other three journeys. Total talk time ranged from 0:40 (in a journey where she made one call) to 3:36 (in a journey where she made two calls). Also, in another journey she made one call with duration of 3:10. All Female C's calls were made with hands-free equipment.

In two out of 90 journeys, a driver answered a mobile call. In both journeys, Female A was the driver, and she answered one call per journey (one call lasted 0:33 and the other for 0:55).

In four out of the 90 journeys the driver texted on their mobile phone. In one journey, Female A texted eight times for a total duration of 0:54; in another journey Male C texted six times for 1:06; and in the other two journeys Male A texted once for 0:25, and once for 0:05.

Eating / drinking

Drivers ate or drank in only seven of the 90 journeys. We interpret 'eat' and 'drink' to mean an individual eating action, such as lifting a bottle to drink, taking a bite from an apple, or removing a sweet/mint from its packet.

In three of these journeys Female C ate once for short durations (0:01 – 0:12). On each occasion she ate a mint. In one journey Young Male A ate five times with a total duration of 0:52. The most significant eating behaviours were by Male A and Male D. In the one journey in which he ate, Male A ate five times, with a total duration of 5:36. Male D ate in two journeys. In one journey he ate seven times for a total of 0:35, and in the other he ate 29 times for a total of 9:17 (though this journey had a duration of 1:20:42, while in all the other journeys where drivers ate, journey time ranged from 11:00 to 22:30).

Reading

In only one out of the 90 journeys did a driver engage in reading. In this journey, the driver (Female C) pulled over to the side of the road to consult a street directory for 1:04.

3.1.2 Passenger Behaviours

Passenger talks to other passenger

As there are only nine journeys where there was more than one passenger, this category is not very informative for quantitative analysis. In six out of the nine journeys a passenger engaged another passenger (rather than the driver) in conversation.

Microanalysis of these events is valuable for determining if the driver participated in these conversations, and/or if these conversations distracted the driver.

Passenger makes mobile call

There are only two journeys where a passenger made a mobile call. In both these journeys the calls were made by a female teen.

In one journey the passenger made two calls, with a total duration of 0:43. In the other journey the passenger made one call with duration of 6:02.

Passenger receives mobile call

There are only two journeys where a passenger received a mobile call. In one of these a female teen passenger received one call with duration of 1:47 (see microanalysis Example 8). In the other journey a male adult passenger received one call with duration of 1:00.

Passenger sings

There are only five journeys where there is video evidence that a passenger sings. In two of these journeys the passenger is a male adult; in the other three journeys the passenger is a female teen. Duration of singing ranged from 0:02 to 0:31. In four journeys the passenger sang once (durations 0:02, 0:02, 0:02, and 0:09); while in the other journey the passenger sang seven times (duration 0:31) (Table 16 below).

Table 16: Journeys where passenger sings

Journey no.	Passenger	Times	Duration
15	Male Adult	1	0:02
23	Female Teen	7	0:31
24	Female Teen	1	0:02
74	Female teen	1	0:02
79	Male Adult	1	0:09

Passenger adjusts entertainment system

Passenger adjusted entertainment system in 12 out of 46 journeys where there were passengers. After talking, this is the most frequent potentially distracting passenger behaviour. The number of times per journey range from once or twice (most common) up to eight times (two journeys). Duration of time spent adjusting entertainment system ranged from 0:01 (once) to 1:38 (in a journey where the system was adjusted eight times) (see Table 17 below).

Table 17: Passenger adjusting the entertainment system

No. of journeys	No. of times adj. ent. system	Duration
4	**1**	Between 0:01 and 0:05
4	**2**	Between 0:05 and 0:46
1	4	0:06
1	6	0:16
2	8	Between 0:19 and 1:38

Passenger adjusts climate control

Passengers adjusted climate control in six out of 46 (13%) journeys where there were passengers. Number of occasions ranges from one to four times, with a duration range from 0:01 to 0:08. (See Table 18 below).

Table 18: Passenger adjusts climate control

No. of journeys	No. of times adj. climate control	Duration
3	1	Between 0.01 and 0:02
1	2	0:02
1	3	0:08
1	4	0:05

3.2 Qualitative results - microanalyses of video recorded instances of distraction

The examples in this section are the heart of this study, and represent its distinctive contribution to the literature on distraction in driving. As discussed in detail in Section 2.2 above, this study's particular innovation and contribution is to draw on the researchers' expertise in methodological fields which involve, most directly, the micro-detailed transcription and analysis of recorded behaviours and practices, using naturally occurring data, to examine conduct in actual real-world settings. Researchers worldwide have for over three decades conducted qualitative micro-detailed studies of video recordings of behaviours in real-life situations, across a huge range of settings for conduct and interaction (especially including spoken interaction). These studies examine precisely how people moment-to-moment successfully organise and undertake relevant activities and accomplish setting-specific tasks and goals. They emphasise the value for studying and understanding human behaviours in their own terms as involving the complex coordination of simultaneous activities within dynamic contexts. The present study adds to only a handful or so of very recent studies that have conducted such video based micro-detailed investigations of real-world behaviours in cars. This research focuses on the actions, language and embodied practices of social interaction and activity within the physical and spatial configuration of the car.

The examples in the following sub-sections therefore provide detailed qualitative descriptions and analyses of the moment-to-moment occurrence of in-car distractions to driving. The examples show how drivers (and passengers) orient to, are visibly impacted by and coordinate their moment-to-moment behaviour with various distractions to driving. The analyses build upon video-recordings of actual everyday driving situations and transcriptions made of them. These focus on the participants' actions, talk and embodied behaviour and how they are indicative of the presence, influence and impact of a distraction.

Understanding the examples

We present each example to be self-contained, and so to be read and understood individually and independently. Therefore examples can differ slightly and inconsequentially in format. Some of the examples below include separate detailed transcriptions of conversation, in keeping with practices for conversation analysis as outlined in the method section above.

For each example we present a general sense of the circumstances for driving, we then highlight key events and activities and their relation to driving, and we then draw out the possible significance for understanding the nature of in-car driver distraction. In the Discussion and Conclusion sections of this report we draw out some recurring features across all of the detailed examples.

Note the following for reading each example. First, the time indicated refers to elapsed journey time, not the time of day. Second, we have made an attempt to offer broad characterisations of the nature of the driving situation. For example, 'rural driving' refers to driving on low traffic and moderate speed roads (e.g. usually ranging from 60–80kph, occasionally up to 100kph) in areas outside built-up urban situations, such as between a city and a country town, or between country towns. By 'inter-city' driving we refer to high traffic but high speed driving (110kph), such as on major freeways between cities (e.g. between Canberra and Sydney). By 'traffic' driving we refer to situations where there is frequent stopping and picking up speed, for example to respond to traffic signalling and to coordinate with the flow of other vehicles. In 'intra-city' driving the situation is within an urban built-up area but with relatively few or only occasional constraints, such as through suburban streets or on more significant roads but with lighter traffic. 'free' driving refers to no or relatively light traffic.

3.2.1 Journeys with driver as sole occupant

3.2.1.1 Example 1: Audio entertainment system

Files: Tues14Apr1142amRear and Tues14Apr1143amFront

Driver: Male driver, established, >5 years driving experience

Passengers: No passengers

Driving Situation

Varied: intra-city suburban and main roads, then inter-city highway

Two camera views are used to capture some details. The cameras reveal different details and so times to the left will not match.

NOTE: 'Time' refers elapsed recording time, NOT to the time of day.

REAR Camera view

Time	Occupant	Action	Driving situation
02:00	Dvr		Stopping at traffic lights
02:08	Dvr	Tilts head down and left, moves left hand from wheel to turn on audio entertainment system: radio	Stopped at lights
02:20	Dvr	Returns left hand to wheel, raises and straightens head to orient forwards towards windscreen	Drives off as traffic moves when lights change to green
02:34	Dvr	Tilts head down and left, moves left hand from wheel to adjust dial for radio	Free driving intra-city
02:35	Dvr	Returns left hand to wheel, raises and straightens head to orient forwards towards windscreen	Free driving intra-city
02:46	Dvr	Tilts head down and left, moves left hand from wheel to adjust radio dial	Free driving intra-city
02:48	Dvr	Returns left hand to wheel, raises and straightens head to orient forwards towards windscreen	Free driving intra-city

FRONT Camera view (file: Tues14Apr1143amFront)

Time	Occupant	Action	Driving situation
2:00			Stopping at traffic lights, in traffic
2:08	Dvr	Tilts head down and left, looks towards audio entertainment system, moves left hand from wheel to entertainment system	Stopped at traffic lights
2:24	Dvr	Rapid glance forward to windscreen, head remains tilted down and to left, resumes looking towards entertainment system display, left hand remains at entertainment system	Stopped at traffic lights
2:26	Dvr	Returns left hand to wheel, raises and straightens head to orient forwards towards	Drives off as traffic moves when lights change to green

Time	Occupant	Action	Driving situation
		windscreen, looks forward	
2:34	Dvr	Tilts head down and left, looks towards entertainment system, moves left hand from wheel to entertainment system	Free driving intra-city traffic
2:46	Dvr	Tilts head down and left, looks towards audio entertainment system, moves left hand from wheel to entertainment system,	Free driving intra-city traffic
02:48	Dvr	Returns left hand to wheel, raises and straightens head to orient forwards towards windscreen	Free driving intra-city
2:54	Dvr	Looks towards entertainment system display, head remains oriented forwards towards windscreen	Free driving intra-city traffic
2:55	Dvr	Resumes looking forward	Free driving intra-city traffic

Distracting elements

- audio entertainment system

Impacts on driving activities

- removes left hand from wheel, manipulates audio entertainment system
- looks away from road

Discussion

This example shows the driver using the audio entertainment system, first turning the system on (02:08), and then on two occasions (02:34; 2:46) adjusting the radio to search for and select a station. The driver looks down to the system each time throughout contact with the system. Therefore the duration of the whole distraction activity, including all contact with the entertainment system, extends for around 40 seconds. The two occasions for searching for a station last for around one second and two seconds. The example uses two camera views to capture some details, such as gaze movement.

The driver first turns the system on when the car is stopped at lights, beginning 8 seconds after the car stops, and he returns his left hand to the wheel to begin driving as the lights change and surrounding traffic moves off. He adjusts the radio twice while the car is in motion, in free driving in city traffic. The front camera view shows that about three seconds after adjusting the radio the second time the driver glances quickly (less than one second) at the system's display while his head is still raised and oriented forward to the windscreen.

The example shows how the distraction of searching for a radio station occurs as a series of activities spread over time, and relative to different driving situations (stopped, in motion). First when the car is stopped the driver turns the system on and begins to search for a preferred station, but then when the light changes to green and surrounding traffic begins to move off the driver ceases searching and returns his left hand to the wheel to drive. The next two activities for searching for a station occur as the vehicle is in motion in free traffic driving, and so the driver handles the vehicle by steering with his right hand only. Periods where the driver has only one (right) hand on the wheel while in motion are brief, lasting 1 or 2 seconds. The activity continues in one form after selecting a station when the driver looks quickly at the display while the vehicle is in motion.

The two cameras allow us to determine both the orientation of the driver's head and the direction of his looking. The rear camera made it to say with confidence what the driver was doing with his hand as he contacted the audio entertainment system. The front camera made it possible to determine not just the orientation of the driver's head but also the direction of his looking. Importantly, this front camera made it possible to identify two examples of looking, to and away from the road, which the rear camera missed. We could see therefore that the driver looks to the entertainment system while driving, when the activity would seem to have been finished, and also that the driver looks forwards towards the windscreen and the external driving environment when he would seem to be involved in the distracting activity of using the audio entertainment system.

3.2.1.2 Example 2: Driver uses handkerchief

File: tues14Apr1142amrear

Driver: Male driver, established (>5 years driving experience)

Passengers: No passenger

Driving situation

Free intercity highway driving.

NOTE: 'Time' refers elapsed recording time, NOT to the time of day.

REAR CAMERA view (recording no: tues14Apr1142amrear)

Time	Occupant	Action	Driving activity
05:12	Dvr	Moves left hand from wheel to left towards front passenger seat, head is raised and straight and oriented forward towards windscreen	Free intercity-highway driving
05:16	Dvr	Picks up handkerchief, holds handkerchief in left hand with arm resting on central console, head is raised and straight and oriented forward towards windscreen	Free intercity-highway driving
05:17	Dvr	With left hand raises handkerchief to face, rubs handkerchief against nose, head is raised and straight and oriented forward towards windscreen	Free intercity-highway driving
05:30	Dvr	Left hand moves left towards front passenger seat, places handkerchief on front passenger seat, head is raised and straight and oriented forward towards windscreen	Free intercity-highway driving
05:33	Dvr	Left hand returns to wheel, head is raised and straight and oriented forward towards windscreen	Free intercity-highway driving

FRONT CAMERA view (recording no: tues14apr1143amfront)

Time	Occupant	Action	Driving activity
23:19	Dvr	Left hand leaves wheel, moves left to front passenger seat, head is raised and straight and oriented forward towards windscreen, head tilts slightly to right, body shifts slightly to right	Free intercity-highway driving
23:30	Dvr	Holds handkerchief in left hand just below and	Free intercity-highway driving

Time	Occupant	Action	Driving activity
		away from face, looks down towards driving instruments, head tilts down then raised again to orient forwards towards windscreen	
23:33	Dvr	Glancing look towards right	Free intercity-highway driving
23:34	Dvr	Raises left hand with handkerchief towards face, resumes rubbing nose	Free intercity-highway driving
23:37	Dvr	Left hand moves towards front passenger seat, places handkerchief on seat, head turns left and down slightly towards entertainment system	Free intercity-highway driving
23:38	Dvr	Head returns to raised and straight oriented towards windscreen	Free intercity-highway driving
23:39	Dvr	Left hand raised to return to wheel from front passenger seat	Free intercity-highway driving

Potential distracting elements

- reaching for object
- grooming (using handkerchief for rubbing nose)

Impacts on driving activities

- removes left hand from wheel
- uses left hand to reach for object
- uses left hand for grooming activity – rubs nose with handkerchief

Discussion

In this example the driver is engaged in free driving in a intercity highway situation. The example shows a driver reaching for an object and then using that object for a grooming activity. Specifically, the driver reaches to the front passenger seat for a handkerchief, and then uses the handkerchief to rub his nose. The duration of the distraction, from first beginning to reach for the object to returning his left hand to the wheel, is 21 seconds. For this period the driver's left hand is off the steering wheel and he is steering one-handed with his right hand. He rubs his nose for 12 seconds.

We can note that the driver does not shift his gaze from the road ahead to look for the handkerchief. Throughout this example the driver continues to look forwards through the front windscreen. It seems that the driver has earlier placed the handkerchief on the front passenger seat such that he is able to reach for and find it without the need to look. This suggests that the driver has anticipated a possible need for the handkerchief, and placed it so that it could be found and used easily, without looking. It seems that drivers can pre-organise distractions by placing them to facilitate their possible future use.

We see also that after he first reaches for and finds the handkerchief the driver briefly rests his arm on the central console with the handkerchief in his left hand, for a little over a second, before next raising the handkerchief to his face. The driver continues to look forwards through the windscreen.

The data suggest that the driver conducts the grooming activity in two stages: first reaching for and obtaining the handkerchief; and then second using the handkerchief. Such a staging appears to occur as the driver continues to monitor the road ahead. So the driver appears to initiate the actual grooming activity, which will involve rubbing his nose and potentially impacting his field of vision,

only after first assessing the road and traffic conditions to ensure that they allow for this activity. The apparent staging would allow the driver, if necessary, to pause or abandon the actual grooming activity if road and traffic conditions are unfavourable, and might require both hands on the wheel and a forward view free from the potential obstruction of a handkerchief moving at his nose.

Summary

The example appears to show how the driver coordinates the distracting activity alongside the demands of driving, and that this has involved a certain degree of prior preparedness. One can prepare for and coordinate certain distractions when they are expected.

3.2.1.3 Example 3: Driver changes glasses

File name: sun17may533pmFront

Driver: Female driver, experienced (>5 years driving experience)

Passengers: No passengers

Ent. Syst.: Audio entertainment system is on - radio discussion program

Timing: begins 2:38 ends at 2:50

Duration: approximately 12 seconds

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
02:36	Dvr	Looks up and left to overhead storage compartment; simultaneously lifts left hand to compartment	Rural driving
02:37	Dvr	Looks forwards	Rural driving
02:37	Dvr	Looks up and left to storage compartment	Rural driving
02:38	Dvr	Looks forwards	Rural driving
02:38	Dvr	Removes sunglasses from compartment	Rural driving
02:39	Dvr	Moves left hand to wheel while holding sunglasses, opens glasses	Rural driving
02:40	Dvr	Looks down to wheel and sunglasses (moves sunglasses from left to right hand)	Rural driving
02:41 to 02:42	Dvr	Lifts left hand to face, removes glasses, moves left hand to wheel while holding glasses; lifts right hand holding sunglasses to face	Rural driving
02:42	Dvr	Fits sunglasses	Rural driving
02:43	Dvr	Returns right hand to wheel	Rural driving
02:44 to 02:47	Dvr	Folds glasses with left and right hands, both hands are on wheel	Rural driving
02:48	Dvr	Lifts left hand towards storage compartment adjacent to rear view mirror; looks up at left towards storage compartment; looks forward	Rural driving
02:49	Dvr	Closes storage compartment	Rural driving

02:50	Dvr	Left hand moves to wheel	Rural driving

Distracting elements

- reaching for object
- handling object (two pairs of glasses, a storage compartment door)
- grooming (removing and fitting glasses)

Impacts on driving activities

- removes left hand from wheel
- removes right hand from wheel
- uses left hand to reach for object
- uses left and right hands to handle objects
- uses left and right hands for grooming activities – removing and fitting sunglasses

Discussion

In this example the driver changes the glasses she is wearing. While in free driving in a rural situation she removes her current clear glasses and fits a pair of sunglasses. The example shows how the driver coordinates with her driving activities the tasks of looking for, reaching for and handling objects, and grooming. The example shows in particular the possible demands on looking (gaze direction) and maintaining manual contact with the wheel. We see the driver apparently orienting to minimising the time spent looking away from the road, or removing hands from the wheel, and also minimising the amount time when she is *both* looking away *and* has one hand off the wheel. There are moments when the driver handles the glasses, while moving them from one hand to the other, or to and from the overhead storage compartment (adjacent to the rear view mirror) where they are kept, while looking forwards to the road ahead. That is, she handles the glasses while not looking at what she is doing with them, but instead mostly looking forwards to the road ahead.

The driver initiates the distracting activity by simultaneously and in tight synchrony looking up and left to the overhead storage compartment and lifting her left hand from the wheel towards that compartment. Within the 3 seconds it takes her to find the sunglasses and return her hand to the wheel, the driver twice returns her gaze forwards towards the road ahead. While using her left hand to open the compartment and find the glasses, she looks forwards to the road ahead, before returning her gaze up and left towards the compartment and then looking forwards again just before (within the same second) she begins to remove the glasses from the compartment. She remains looking forward as she moves her left hand to the wheel while still holding the glasses.

She looks down briefly and then forwards again (over less than a tenth of second) as she moves the sunglasses from her left hand to her right hand, and then lifts her left hand from the wheel to her face and removes the glasses. She then moves her left hand, now holding the glasses, back to the wheel, and just as the left hand arrives at the wheel she lifts her right hand, now holding the recently found sunglasses, to her face, and then fits the sunglasses before returning her right hand to the wheel. She then folds the glasses, for which it seems that she begins with the left hand and then uses both hands, while both hands remain on the wheel. This folding activity takes around 3 seconds during which she continues to look forwards.

The driver then lifts her left hand, holding the now-folded glasses, towards the overhead storage compartment. Just after beginning to move her hand she looks up and left towards the compartment before returning to looking forwards as her hand arrives at the compartment. She continues to look forwards towards the road ahead as her left hand remains at the compartment to secure the glasses within and to close the compartment door.

The driver's actions have a logical sequence in that by removing the sunglasses first the compartment is empty and so has space free to accept the glasses which she removes. This allows her to make the switch by holding the two sets of glasses in separate hands. Also, we can note that the driver makes this switch at the wheel, with her hands at the wheel, for example instead of placing the glasses in her lap as a kind of temporary space, or perhaps by using the front passenger seat. The driver would appear to be maximising close contact of her hands with the wheel throughout the distracting object handling activity.

Summary

This example shows how the driver, moment-to-moment, manages multiple shifts in gaze direction, from forwards to the road ahead to in-car locations (the overhead storage compartment, the wheel), while she reaches for and handles objects. She maintains forward looking to the road while she engages in the grooming activity, removing one set of glasses and fitting another. The driver shows an orientation to manage these demands by maximising the time spent looking forwards and with her hands on the wheel. The driver therefore embodies her treatment of the driving activities as the priority for her attention and activity.

3.2.1.4 Example 4: Driver uses lip balm and eats mint

FILE: sun17may533pmFront; NO rear camera view

Timing: starts at 3:40 ends at 4:14

Duration: approximately 34 seconds

Driver: Female driver; experienced (>5 years driving experience); no passengers

Ent. Sys.: audio entertainment system is on (a radio discussion program).

Driving situation

Rural driving

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
03:40	Dvr	Looks down and left to central storage console, simultaneously moves left hand towards central console	rural driving
03:41	Dvr	Looks forward, left hand searching for object at central storage console	rural driving
03:43	Dvr	Looks down and left towards central storage console, left hand searching for object at central storage console	rural driving
03:44	Dvr	Looks forward, left hand searching for object at central storage console	Rural driving
03:46	Dvr	Looks forward, lifts hand to wheel while holding stick of lip balm, removes lid, shifts lip balm to right hand	Rural driving
03:47	Dvr	Lifts right hand to mouth holding lip balm, applies lip balm	Rural driving
03:50	Dvr	Right hand moves to wheel, looks down to wheel as puts cap on lip balm stick	Rural driving

Time	Occupant	Action	Driving activity
03:51	Dvr	Looks forward	Rural driving
03:52	Dvr	Moves left hand holding lip balm stick towards central storage console, simultaneously looks down and left towards central storage console	Rural driving
03:53	Dvr	Looks forwards, left hand handling object at central storage console	Rural driving
03:54	Dvr	Looks down and left towards central storage console, left hand handling object at central storage console	Rural driving
03:55	Dvr	Looks forwards, left hand handling object at central storage console	Rural driving
03:56	Dvr	Looks up and left to rear view mirror, left hand handling object at central storage console	Rural driving
03:57	Dvr	Looks down and left towards central storage console, left hand handling object at central storage console	Rural driving
03:58	Dvr	Looks forward, left hand handling object at central storage console	Rural driving
03:58	Dvr	Looks down and left towards central storage console, left hand handling object at central storage console	Rural driving
03:59	Dvr	Looks forward, left hand handling object at central storage console	Rural driving
03:59	Dvr	Looks down and left towards central storage console, left hand handling object at central storage console	Rural driving
04:00	Dvr	Looks forwards, left hand handling object at central storage console	Rural driving
04:01	Dvr	Looks down and left towards central storage console, left hand handling object at central storage console	Rural driving
04:02	Dvr	Looks forwards, left hand handling object at central storage console	Rural driving
04:02	Dvr	Moves left hand to lap, sounds as evidence (metal) she is handling mints container	Rural driving
04:07	Dvr	Lifts left hand to mouth, holding mint	Rural driving
04:08	Dvr	Puts mint in mouth, moves left hand to lap	Rural driving
04:10	Dvr	Looks towards rear view mirror, looks forwards, handling mints container in lap	Rural driving
04:12	Dvr	Looks down and left, moves left hand towards central storage console	Rural driving
04:13 to 04:14	Dvr	Looks forward, left hand handling object at central storage console, left hand moves to wheel	Rural driving
	Dvr		Rural driving

Potential distracting elements

- reaching for objects (stick of lip balm, food – a mint)
- handling objects (stick of lip balm, food – a mint)
- grooming (applying lip balm)
- eating (a mint)

Impacts on driving activities

- removes left hand from wheel
- removes right hand from wheel
- uses left hand to reach for object
- uses left and right hands to handle objects
- uses right hand for grooming activity (applying lip balm)
- uses left hand for eating activity
- looks away from the road

Discussion

To summarise this example, the driver reaches for a stick of lip balm, applies the lip balm, replaces the lip balm, and then reaches for a container of mints, and then removes a mint and puts it into her mouth, and replaces the container. Involved also, but not clearly visible on the recording, the driver handles the objects in order to use them, for example to remove and replace the cap and lid of the two items.

The example, shows especially the intense and moment-to-moment demands to coordinate looking and hand movement for both driving and non-driving activities. The example occurs on the same journey as Example 3, under a minute later. Like in Example 3, here the driver repeatedly looks between the road ahead and the in-car location of distracting activity, the central storage console between the two front seats. That is, the driver shares her visual attention and hand movements between driving and distraction activities. The driver orients to the need to maintain visual contact with the road ahead, with looking away from the road occurring at particular moments in the course of the distracting activity. In short, the driver looks away when initiating distracting activities, and looks back to the road as distracting activities are established and underway.

First distraction

The first distraction here begins as the driver simultaneously and suddenly both looks down and to her left, and moves her left hand, towards the central storage console between the two front seats (03:40). The driver keeps various items at this location, including four containers of mints, a stick of lip balm, and a bottle of drink. The first thing to highlight therefore is that to initiate the distracting activity the driver's looking and reaching actions occur simultaneously and in tight synchrony.

We can describe the activity with the lip balm as follows. As the reaching activity is initiated, with her hand still searching for an item at the storage console, the driver turns her head to return her gaze forwards towards the road ahead. This lasts less than two seconds before, while still searching with her hand, she again looks down and left towards the storage console (03:43). While still searching she looks forwards again (03:44), before moving her left hand to the steering wheel while holding the stick of lip balm (03:46). With her hand on the wheel she removes the cap from the stick, and shifts the stick to her right hand (03:46). With her right hand she then immediately lifts the stick of lip balm to her mouth and applies some balm for around 3 seconds (from 03:47). She moves her right hand back to the wheel and briefly looks down to the wheel (03:50), likely because she is replacing the lid of the balm stick, before again looking forwards (03:51) and then she simultaneously looks down and left towards the central storage console while moving her left hand,

now holding the stick of lip balm, towards central storage console (03:52). With her hand arrived at the console she returns her gaze to look forwards (03:53).

So the process of this grooming activity, which involved searching for, handling (applying), and replacing an object (lip balm), has taken around 22 seconds, during which the driver looked away from the road five times.

We see though that each time the driver returns her gaze forwards such that much of the period of searching for the object, or handling the object (moving it from one hand to the other, removing the cap/lid), involves only one hand at a time while the driver mostly looks forward to the road ahead.

The example shows how gaze shift and hand movement act in close synchrony to initiate the distraction activity, or at a key moment in the activity (replacing the lip balm). The example shows how the driver continually looks back to the road ahead, and so can be seen to allocate just sufficient gaze to progress the distracting activity, in this case to identify the location of the item to search for or replace it.

Second distraction

In this example this first distraction then blends smoothly into a next. With her hand now at the central storage console, having replaced the stick of lip balm, the driver initiates another activity, reaching for a container of mints. The driver treats the location of her hand, off the wheel, as an opportunity for moving from one distracting activity to another. The driver's hand therefore spends more time away from the wheel, but the driver negates the need to move her left hand back and forth between the wheel and the central console.

After looking forwards (03:53) the driver again looks down and left towards the central storage console where she is handling an object with her left hand (03:54). Within a second she again looks up and forwards (03:55) and then also up and left to the rear view mirror (03:56). She then again looks down and left to the central storage console (03:57) before again quickly looking forwards and then again down and left (03:58), and then repeating this gaze movement twice more (03:59–04:02) before finally looking forwards as she moves her left hand to her lap (04:02). So in the eight seconds it takes her to reach for and find the container of mints, and bring it to her lap, she looks down and left to the central console and then back forwards to the road ahead 5 times. These looks are therefore very quick, on average less than a second.

Over the next 5 seconds or so the driver's hand is not in view (note also that the driver did not set up the rear camera on this journey) so we cannot see what she is doing. But there are sounds of metal and clicks, and then at 04:07 she lifts her left hand to her mouth to eat a mint. So we can assume that in this time preceding 04:07 she is opening the container and finding a mint. She then moves her left hand to her lap (assuming that if the hand were on the wheel it would be visible to the camera). Throughout this activity she continues to look forwards. She then looks up and left to the rear view mirror and then forwards again, while handling the mints container in her lap, presumably closing the lid. Two seconds later she looks down and left and simultaneously moves her left hand left towards the central storage console, before returning her gaze forwards as her left hand arrives at the console, replaces the mint container there, and then moves back to the wheel. So looking away from the road, initially occurring simultaneously with the hand movement, is again ended earlier, returning to the road ahead.

The two instances of distracting activity in this example seem to indicate the possibility for the driver to allocate looking in precise economical ways to, in effect, coordinate driving and a distracting activity. It seems that once the necessary work of looking is completed, to identify the location of/for an item, to target where the hand is headed, looking can then be quickly returned forwards to the road ahead. In the two instances here the hand is then left to work on its own. So the distraction initially involves two modalities (eye, hand) but then is continued mostly with only one

(hand) and the other (looking) only occasionally. Looking and hand movement may be coordinated to act closely together or as independently and differentiated in timing.

The instances show also how the driver orients to the need to have her hands at or near the steering wheel. We see that she handles both the stick of lip balm (removing and replacing the lid) and the container of mints (opening/closing the lid) with her hands either both at the wheel, or close to the wheel in her lap. Keeping her hands at or close to the wheel would seem also to be economical in terms of driving activity if it can best allow the driver to ensure both hands are at the wheel if necessary.

Summary

This example shows features of the serial occurrence of distractions. It shows how one distraction (eating) immediately follows another (grooming): distractions occur in a series. Indeed, we can note that this segment occurs only around 50 seconds after Example 4, so we see a cluster of distracting activities occurring within a period of around one and half minutes. The two examples occur in the early moments of the journey. This suggests that for this journey or this driver at least, the early stages of the journey are busy with distracting driving activities. Also, the placement of many packets of mints (of different flavours) and lip balm in the central storage console suggests that this driver is well prepared to use these items, and indeed that maybe their use is a common habit for her driving. Indeed the design of vehicles to include ample space for such items suggests that car makers make it maximally possible for drivers to engage in the distracting activities described here.

3.2.1.5 Example 5: Driver uses moisturising lotion, makes mobile call

File: mon23mar802amFront

Driver: Female, established >5 years driving experience

Passengers: No passengers

Driving situation

Free driving on main intra-city road

NOTE: Times indicate the point in the recording, NOT the time of day

TIME	OCCUPANT	ACTION	DRIVING SITUATION
17:18	Dvr	picks up phone in right hand, holds phone at wheel, places phone in lap, right hand remains off wheel	Free driving
17:30	Dvr	returns hand to wheel for changing gear	
17:36	Dvr	looks down to lap at phone	stopped
17:40	Dvr	looks forward, immed. looks back to lap	stopped
17:46	Dvr	looks forward, immed. looks back to lap	stopped
17:50	Dvr	looks forward, returns hand to wheel	moves off
18:05	Dvr	handles phone in lap	free driving
18:18	Dvr	moves hair from face with left hand	free driving
19:00	Dvr	sings along while CD playing	free driving
19:20	Dvr	raises mobile phone, held in right hand	slowing to a stop
19:21	Dvr	looks down, opens phone, enters number to initiate a call	moving slowly in queued traffic
19:26	Dvr	looks forward	stopped
19:28	Dvr	looks down to phone held at wheel	moving slowly in queued traffic
19:32	Dvr	looks forward	moving slowly in queued traffic
19:34	Dvr	looks down to CD player, looks back to phone	moving slowly in queued traffic
19:37	Dvr	takes both hands off wheel, holds phone to ear with RH, LH turns down music volume down to silent	stopped
19:42	Dvr	puts gear into neutral	stopped
19:54	Dvr	holds phone to ear with right hand, "hi Stephanie… could you please tell dad that he's left his mobile phone in the car? … um the red car that I'm currently driving … OK so if he looks for it … OK thanks darling bye"; when begins to talk shifts gear with left hand, changes gear while talking with phone held to ear with right hand, changes gear – hand off wheel, no hand on wheel during gear changes	begins to move off, accelerates
20:16	Dvr	"bye", closes phone with chin, puts phone in bag, hand back on wheel	slowing to stop, stops, then driving off
20:41	Dvr	moves left hand to increase music volume	slowing to stop
20:50	Dvr	moves left hand to skip CD track	stopped
20:52	Dvr	sits upright again hands in lap looking forward	stopped
21:06	Dvr	engages handbrake	stopped
21:07	Dvr	left hand picks up CD case, looks at CD case, replaces	stopped
21:18	Dvr	CD case back on console	stopped
		looks forward	stopped
21:19	Dvr	reaches for lotion bottle, puts on hand lotion on back of left hand, looks up and forward often	stopped
21:25	Dvr	puts blob of moisturising lotion on back of left hand	stopped
21:30		replaces lotion bottle on central console	

Example 5: Moisturing lotion, mobile call (cont.)

TIME	OCCUPANT	ACTION	DRIVING SITUATION
21:31	Dvr	shifts gear, disengage handbrake, returns hands to wheel	moving off
21:37	Dvr	with right hand rubs lotion from back of left hand onto cheeks and chin stopped picking up speed, in slow traffic	
21:47	Dvr	right hand, on chin, left hand leaves wheel to shift gear	
21:49	Dvr	right hand rubs lotion into cheeks, forehead,	moving off
21:58	Dvr	right hand rubs hand lotion into forehead	free driving
22:03	Dvr	begins singing along to CD again	free driving
22:17	Dvr	right hand rubs in hand lotion remaining on left hand	slow driving in traffic
22:31	Dvr	as car stops, looks up and over front traffic, takes both hands off wheel and rubs lotion into forehead	stopped
22:33	Dvr	right hand returns to wheel, left hand to gear, shifts gear	stopped
22:37	Dvr	places both hands on wheel	stopped
22:38	Dvr	left hand moves to gear stick	stopped
22:43	Dvr	engages handbrake	stopped
		Journey continues later	
28:40	Dvr	sings along to CD	indicating to turn, slowing to stop
28:45	Dvr	looks left down to lotion	stopped
28:47	Dvr	left hand picks up lotion, looks up through windscreen	stopped
28:48	Dvr	opens bottle with RH	stopped
28:52	Dvr	left hand pours lotion onto right forearm, looks down and right to arm	stopped
28:55	Dvr	replaces lid on bottle with right hand, holds bottle with left hand, looks forward	stopped
28:57	Dvr	returns lotion bottle to console, looks down and left	stopped
28:59	Dvr	with finger of left hand rubs lotion into right arm, looks down to arm	stopped
29:00		right hand returns to wheel, left hand rubs lotion into neck, looks forward	stopped
29:04		left hand gets lotion from right arm, rubs lotion onto chin, looks up at rear view mirror to see face	stopped
29:06		left hand shifts gear	moving off
29:07		left hand rubs lotion into chin and cheeks	accelerating
29:16		stops rubbing, left hand shifts gear, left hand moves to wheel to execute turn	free driving, slows then turns
29:25			turn completed, both hands on wheel, free driving
29:31		resumes singing along to CD	free driving

Example 5: Moisturing lotion, mobile call (cont.)

TIME	OCCUPANT	ACTION	DRIVING SITUATION
30:02		left hand wipes chin, cheek, neck	free driving
30:06		returns left hand to wheel, looks up at self in rear view mirror	free driving
30:16		raises sunglasses	slowing
30:17		left hand moves to right arm, takes handlotion, rubs lotion onto nose, under eyes	slowing
30:20		looks forward	slowing
30:22		looks to see self in rear view mirror	slowing
30:27		continues looking at self in rear view mirror, rubbing lotion under eyes, and nose and forehead	stopped
30:28		returns to looking forward, left hand continues rubbing lotion on forehead	stopped
30:30		looks to rear view mirror, uses right hand to rub lotion, holds left hand up and off wheel (streak of lotion is visible on right arm)	stopped
30:40		returns right hand to wheel	stopped
30:44		looks forward, left hand rubbing lotion on face	stopped
30:47		left hand gets lotion of right arm, rubs lotion over face	stopped
30:53		left hand shifts gears	moving off
30:54		left hand rubs lotion into face	moving off
30:55		looks into rear view mirror to see face	accelerating
30:56		looks forward	accelerating
30:58		looks into rear view mirror to see face, rubbing in lotion	free driving
31:00		left hand returns to wheel, looking forward	free driving
31:04		right hand adjusts sleeve on left hand (left hand is on wheel), right hand moves sunglasses down	free driving
31:05		right hand returns to wheel	free driving
31:06		left hand rubs lotion onto right arm	free driving
31:08		left hand shifts gear	
31:09		left hand rubs lotion onto right arm	free driving
31:20		singing along to CD	
31:25		returns left hand to wheel	free driving
31:50		left hand rubs lotion onto right arm	free driving, after turn

Distracting elements

- mobile phone – driver initiates call
- grooming (applying moisturising lotion, adjusting hair and sunglasses)
- music playing (driver sings along)
- reaching for and handling objects
- audio entertainment system

Impacts on driving activities

- driver engages in a distracting activity over an extended period - 10.5 minutes
- driver holds mobile phone in hand while holding wheel
- driver takes hand from wheel to hold mobile phone to ear
- driver uses one hand to rub lotion onto other hand and arm which is holding wheel
- driver takes hand from wheel to adjust entertainment system
- driver takes hand from wheel to handle object (CD case)

- driver looks away from road into RVM to apply hand lotion
- driver looks away from road at in-car objects and entertainment system
- driver looks away from road to own body (right arm)
- driver moves vehicle forward with no hands on the wheel

Discussion

This example shows how various distractions can be *coordinated with driving*, *coordinated with one another*, how a *mobile phone call can impact driving before the actual phone call* and how *one distraction can extend over a significant period of many minutes*. The two most significant distractions are the driver initiating and conducting a mobile phone conversation, and the driver applying moisturising lotion to her hands, arms, and face. We can note first how the driver separates these two distracting activities, performing one after the other. Specifically, the Dvr sequences the distracting activities. The Dvr initiates the activity of applying moisturising lotion (21:19) after the phone call is completed (20:16), and immediately after handling the CD case (21:18).

This example shows how various distractions can be *coordinated with driving activities*. The Dvr completes the call while stopped, the driver resumes driving, and only when the car is again stopped does the driver initiate the activity of applying moisturising lotion. We see also how the driver *coordinates distractions with one another* for example when the Dvr stops singing along to the CD, and then turns the music volume down to silent (19:37), as the car is stopped, before initiating the mobile phone call (19:54). After completing the call she drives off but only then increases the volume once the car is again slowing to a stop (20:41). As the car is stopped the Dvr adjusts the entertainment system by skipping a track on the CD, and only after engaging the handbrake the Dvr reaches for and looks at a CD case. When stopped she places the phone in her bag on the FP seat.

However, as she begins to talk the lights change and the traffic begins to move again. She still has the phone held to ear with her RH, so when changing gear with her LH there are brief moments when she has no hands on the wheel. She terminates the call by closing the phone with her chin as she again slows to stop.

The Dvr coordinates distractions with attention to features of the changing external driving environment, and specifically the flow of traffic. Before initiating a distracting activity the driver appears to look forward out the windscreen to take stock of the traffic situation. When stopped (see from 17:36) the Dvr alternates between looking down at the phone in her lap and up and forward at the queued traffic head of her. She then does not initiate the call. Traffic moves off and after open driving and then when again moving into queued traffic which is slowing to a stop the Dvr then enters the number to actually initiate the call. We see also later that immediately before reaching for the moisturising lotion bottle to begin applying moisturising lotion the Dvr first looks forward through the windscreen (21:18). It seems possible that by this looking the Dvr is assessing the traffic situation for its likely changes and so possible consequent demands on driving, and therefore the context for engaging in the distracting activity. It seems the driver assesses the opportunity to conduct the distraction activity, or part of it, before changes in traffic-dictated demands on driving. Consequently, the analysis shows that also the using and handling of a mobile phone (i.e. not just talking on the phone) especially *before* an outgoing phone call is a potential distraction. We can see how the dvr by frequently looking at the phone is partly distracted from the driving activity. Nevertheless, at the same time the example shows how the Dvr *prepares* to engage in distracting activities, or that distracting activities are *staged* in various ways or undertaken such that they can be interrupted, paused and resumed, to coordinate with the demands of driving activities. As we saw above, the dvr looks up at traffic to determine the relevant or possible moment for initiating the activity.

Dvr makes a call on her mobile phone and is in conversation for around 22 seconds (from 19:54). However, the driver readies the phone by locating it and doing early work to find the right number,

but only actually makes the call when the car is stopped. We can see that phone related activity begins at 17:18 when the dvr, while in open driving, first picks up the phone and after holding in her hand at the wheel then places it into her lap. The phone remains in her lap as driving is stopped and as open driving resumes (17:50). With the phone in her lap, when the car is again moving slowly in queued traffic the driver has easy access to it to enter the number to call (19:21). The call proper actually only begins and proceeds when the car is stopped.

Similarly, in an extended example of personal grooming the driver organises the application of moisturising lotion so that it can be paused and resumed to allow coordination with driving activities. Activity for this distraction begins at 21:19. With the car stopped, the Dvr reaches for the moisturising lotion bottle from the lower console, unscrews the lid and places a portion of lotion on the back of her LH, before then returning the bottle. At various moments over the next 10 minutes and 20 seconds the Dvr is involved in applying moisturising lotion. With the bottle returned, the dvr suspends the moisturising lotion activity when traffic begins to flow and the Dvr moves the car off. When picking up speed but still in slow traffic the dvr uses her RH to first rub lotion from the back of her LH onto her cheeks and forehead. Then during open driving the dvr again uses her RH to rub lotion onto her forehead (21:58). When again in slow moving traffic she rubs remaining lotion into her LH (22:17), and immediately when next stopped removes both hands from the wheel to rub lotion into her forehead (21:58). Therefore by placing a sufficiently large portion of moisturising lotion on her hand the driver is able to access and apply the lotion at various points in driving.

The driver again initiates a new activity to apply moisturising lotion. After a further six minutes of driving, and singing along to the CD, the car again comes to a stop and the dvr again looks left and down to the bottle of moisturising lotion (28:45). While stopped she pours some lotion onto her right forearm, replaces the lid, returns the bottle, and then with RH rubs lotion into right arm and then neck and chin (from 28:47). The dvr alternates between looking down to the bottle and her arm and also up and forward through the windscreen to the road ahead (28:55), and then at the RVM to see her face (29:04). Traffic begins moving and the car moves off (29:06), which requires the dvr to use her LH to shift gears, but she then again rubs lotion into her face before stopping to shift gear again and use both hands on the wheel to execute a turn. When in open driving the dvr again wipes her face (30:02), before returning her LH to the wheel and then looking at her face in the RVM (30:06). When slowing the driver raises her sunglasses (30:16), and uses her LH to take lotion and apply to her face, onto her nose and under her eyes, places where it is difficult to apply lotion when wearing sunglasses. While slowing the dvr looks to the road ahead before then looking at her face in the RVM (30:22). When the car is again stopped the driver remains looking at her face in the RVM (30:27) and continues to apply lotion (30:28+). While still stopped she finishes applying lotion and returns her RH to the wheel (30:40).

So again, by placing a sufficiently large portion of moisturising lotion on her arm the driver is able to access and apply the lotion at various points in driving. This means that the relatively higher demanding distracting sequence of activities of reaching for the bottle, removing the lid, pouring moisturising lotion, replacing the lid, and finally returning the bottle to its resting place, must be undertaken only once.

Summary

The example shows how distractions are not just cognitive. For example, mobile phones can be understood also as material objects whose handling itself is a distraction (i.e. holding it, looking at it, pressing buttons). That is, we see that the physical use and handling of objects can be a distraction, that drivers can prepare for distracting activities, that drivers can coordinate distracting activities with one another and with the driving and the traffic situation, and that drivers can take action to minimise distractions. The analysis also shows how while being coordinated with driving, a distraction (such as preparing a mobile phone call or applying moisturising lotion) can extend over time.

Importantly, the example highlights some very important points. It is not sufficient to study one distraction at a time and try to figure out how that distraction impacts driving – because distractions occur one after the other and they are coordinated with one another. But still drivers often manage to coordinate the distractions with the driving activity. This is what qualitative analysis can show: a more complicated and authentic picture of real-life distracting driving. Rather than assume situations, such analysis shows the complexity of these situations and that (and how) drivers can also manage these situations.

3.2.1.6 Example 6: Using a map while driving in traffic

Data from: "Habitable cars" by Eric Laurier

File: consulting map.mov

Duration: 0:44

Driving situation

Built-up intra-city driving. Relatively busy traffic.

Occupant information

Female driver alone, she drives for work and she is driving to her next destination.

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
0:00	Dvr	Driving in traffic.	Free intra-city driving
0:08	Dvr	Traffic in front starts slowing down; an intersection and red light.	Slowing down
0:09	Dvr	Shifts gears	Slowing down
0:10	Dvr	Looks to the left seat (papers and a map) (1 second)	Slowing down
0:10	Dvr	Moves left hand to seat, picks up a map	Slowing down
0:12	Dvr	Looks at the map book.	Slowing down
0:13	Dvr	Opens the map book, looks down and flips through pages (2 seconds).	Stopped
0:15	Dvr	Finds the right page. Keeps looking down (2 seconds).	Stopped
0:17	Dvr	Quick glance at traffic.	Stopped
0:17	Dvr	Looks down at map (17 seconds).	Stopped
0:30	Dvr	Lights turn green.	Stopped
0:34	Dvr	Sound of cars setting off. Looks up.	Stopped
0:35	Dvr	Looks down at map (1 second).	Stopped
0:36	Dvr	Puts the map on the passenger's seat with left hand.	Stopped
0:37	Dvr	Rubs forehead with right hand (grooming) (2 seconds)	Starts moving
0:43	Dvr	Looks in rvm	Picking up speed.

Transcription

No talk.

Distracting elements

- driver consulting map

Impacts on driving activities

- driver disattends to traffic lights for several seconds

Discussion

In this example, the driver is the only person in the car and she uses a map. She is driving in a big city with quite a lot of other traffic and pedestrians. She then begins to slow down to a traffic light (0:08) after which she looks to the passenger seat on her left. The seat has some papers and a map on it (0:10). After this she picks up the map (0:10) and starts looking at the map (0:12). She keeps reading the map, taking one glance to the traffic lights in between. The lights turn green (0:30) and possibly due to the sound of cars setting off, she looks up (0:34), takes a quick look at the map (0:35), then puts the map back on the passenger seat (0:36) and after this starts moving.

The driver's actions show that she is planning her route to a destination with the help of a map. In terms of driving distractions, there are two things worth noting. First, the driver coordinates the map use with the surrounding traffic and the driving situation (approaching an intersection with red lights). In other words, she finds an appropriate moment and starts the distracting activity at a moment when driving is less demanding for the driver (at an intersection, during a red light). The example also shows that the driver monitors (by looking at the traffic and the traffic lights) the driving situation and for any changes in it while engaging in the distracting activity. When the driving demands it, she stops the distracting activity (by putting the map away) and continues driving. It is noteworthy that reading a map is qualitatively different from for example talking on a mobile phone or attending to a child in the backseat. Map reading can be terminated immediately after driving demands increase (cf. a phone call) and while reading a map one is easily able to attend to the traffic situation ahead (cf. attending to a child in the backseat which can require a gaze shift or even a repositioning of the upper body).

Second, the fact that the map is placed on the passenger seat shows that the driver is prepared for consulting the map while driving. The location of the map enables the driver to easily find and reach for the map and thus to minimize its negative impact on driving. As we see in the analysis of other examples, drivers frequently place artefacts in the car so that their use impedes driving minimally.

3.2.1.7 Example 7: Driver talking on the mobile phone

Data from "Habitable cars" by Eric Laurier

File: mobile call.mov

Duration: 1:21

Occupant information

Female driver, alone. Driving in a city. Daytime and there is not much traffic. Loud music in the background. Driver starts digging her mobile phone from a bag. She presses buttons on the phone (probably dials) and then puts the phone in a phone rack. She turns off the music. She continues

pressing buttons on the phone and then starts the phone call. An answering machine responds. The driver leaves a message.

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
0:00	Dvr	Loud music. Dvr looks left at passenger seat (less than a second).	Free city driving
0:01	Dvr	Leans over and reaches for bag in front seat passenger's leg room. Looks at traffic. One hand on wheel.	Free city driving
0:02	Dvr	Searches something in the bag, leans on the wheel, looks at traffic. (1 second).	Free city driving
0:03	Dvr	Looks down left at bag. Opens the bag. (1 second)	Free city driving
0:04	Dvr	Continues handling and opening the bag.	Free city driving
0:05	Dvr	Looks at bag. (Less than a second.) Picks up bag.	Free city driving
0:06	Dvr	Puts bag on front seat.	Free city driving
0:07	Dvr	Puts left hand inside the bag, searches for a phone, scratches right thigh (both hands off the wheel for 1 second), keeps on looking at traffic (4 seconds).	Free city driving
0:11	Dvr	Lifts hand from bag, shifts gears.	Slowing down (an intersection and red lights ahead)
0:12	Dvr	Puts hand back in the bag (searches for the phone for 3 seconds), glances left in the bag (less than 1 second)	Slowing down (an intersection and red lights ahead)
0:15	Dvr	Glances in the bag.	Slowing down (an intersection and red lights ahead)
0:16	Dvr	Lifts the phone from the bag.	Slowing down (an intersection and red lights ahead)
0:16	Dvr	Looks at the phone, both hands off the wheel (1 second).	Slowing down (an intersection and red lights ahead)
0:17	Dvr	Looks at the phone, both hands off the wheel (7 seconds).	Slowing down (an intersection and red lights ahead)
0:24	Dvr	Looks up briefly	Stopped
0:24	Dvr	Places the phone on a handsfree rack	Stopped
0:24	Dvr	Reaches for entertainment system	Stopped
0:25	Dvr	Glances quickly at traffic	Stopped
0:25	Dvr	Looks down left, switches off the music (1 second)	Stopped
0:27	Dvr	Looks at the phone in the rack, handles the phone (1 second).	Stopped
0:28	Dvr	Quick glance at traffic	Stopped

Time	Occupant	Action	Driving activity
0:29	Dvr	Looks at the phone, handles the phone (2 seconds)	Stopped
0:31	Dvr	Quick glance at traffic, shifts gears	Stopped
0:31	Dvr	Looks at and handles the phone (2 seconds)	Stopped
0:33	Dvr	Looks up and car starts moving (both hands off the wheel)	Slowly picking up speed
0:34		Dial tone in phone	Picking up speed
0:35	Dvr	Looks at the phone, handles the phone (both hands off the wheel)	Picking up speed
0:36	Dvr	Puts left hand on wheel, continues handling and looking at the phone (2 seconds altogether)	Picking up speed
0:38	Dvr	Withdraws hand, leans back, shifts gears	Picking up speed
0:39	Dvr	Wipes hair	Picking up speed
0:44	Phone	Answering machine answers, answering machine talks for 12 seconds.	Free city driving
0:44	Dvr	Glances at the phone, moves right hand at phone	Free city driving
0:45	Dvr	Lowers hand from phone (one hand on wheel still)	Free city driving
0:46	Dvr	Scratches right thigh	Free city driving
0:54	Dvr	Puts both hands on wheel	Free city driving
0:55	Dvr	Applies the indicator	Free city driving
0:57	Dvr	Leaves a message to the answering machine (both hands on wheel)	Picking up speed
1:01	Dvr	Checks time from dashboard while leaving message	Picking up speed
1:02	Dvr	Shifts gears	Picking up speed
1:08	Dvr	Moves left hand from the gear stick to the wheel and then right hand from the wheel to the phone.	Free city driving
1:10	Dvr	Ends the phone call. Handles the phone with right hand.	Free city driving
1:11	Dvr	Right hand back on the wheel, left hand quickly reaches for the entertainment system and drv looks down left.	Free city driving
1:12	Dvr	Moves left hand to the gear stick.	Free city driving
1:18		Music starts playing	Free city driving

Transcription

```
1            ((loud music for 26 seconds))
2            ((music ends))
```

```
3             (6.0)
4   PHONE:    ((dial tone)) (9.5)
5   ANS.MACH: Welcome to the (                                ).
6             (0.7) I'm sorry, but the person you ca:lled, is
7             not available. (.) .hh Ple:ase lea:ve your message after the
8             tone.
9             (1.0) (      ) or record (  ), press one, at any time. (0.7)
10            ((tone))
11  DVR:      (Mai::), its Megan, u:h, I was just wondering when you get
12            your lunch, (.) maybe, (.) you had already, but,
13            .hh E:h, I'm just (.) gonna be in the a:rea,
14            a:nd I was gonna pop by: your work, but,
15            (.) Gimme a phone when you get (back, 'kay,        )
16            (8.5)
17            ((loud music starts))
```

Distracting elements

- reaching for a bag
- searching and reaching for a mobile phone (in a bag in the front seat)
- using, looking at and handling a mobile phone
- making a call, handling a handsfree system (loudspeaker system)
- leaving a message to an answering machine
- loud music, using the entertainment system

Impacts on driving activities

- taking hands off the wheel
- looking away from traffic and the road

Discussion

This above extract provides an example of a driver's actions as she prepares to make a phone call while driving. The driver is driving alone in a city. There is not much traffic. During the example the driver stops at an intersection (0:24) and turns right at another one (0:55). The driver is listening to loud dance music. At the outset of the example the driver begins a series of actions that lead to the making of a phone call. At the beginning of the extract, she orients to her bag that is located in the front seat passenger's leg room (0:01) and starts searching for a phone in the bag (0:02). At this point, she is maintaining steady speed. Her gaze is withdrawn from the road three times in very rapid sequences. After this she picks up the bag from the leg room (0:05) and puts the bag on the front seat passenger's seat (0:06). While doing this and while continuing to search for the phone in the bag she keeps her gaze on the road. At one point she scratches her right thigh quickly at which point neither of her hands are on the steering wheel (0:07). She maintains her gaze oriented on the road and the traffic ahead. She searches for the phone for 4 seconds but does not find it (0:07). At this point, the traffic begins to slow down and she suspends the search, removes her hand from the bag and shifts gears (0:11). Then, as she is slowing down, she puts her hand back into the bag and at the same time makes a quick glance into the bag and then returns her gaze to the road (0:12). She continues searching for the phone, looks into the bag again and then finds the phone. She then lifts up the phone from the bag (0:16) and looks at the phone's display (0:17), which co-occurs with the car coming to a full stop. While the car is at a stop at the intersection, the driver looks at the phone (0:17, for an extended period, for 7 seconds), places the phone on a rack (on the wheel's right) (0:24), turns off the music (stereo system below on the left, behind gear stick) (0:25) and presses buttons on the phone (i.e. dials a number) (0:27). Although there are some intermittent glances by which the driver monitors the traffic situation ahead, while the car is at a stop, the driver is primarily oriented to the technological devices in the car.

It is worth noting that as the example shows while handsfree devices can free drivers' hands to the driving, they do not prevent drivers from handling the phone (e.g. pressing buttons) or looking at the phone *before* the phone call. In other words, as physical artefacts, phones and handsfree devices involve acts of looking and handling (especially before and after phone calls) that require drivers' attention and can distract them from driving.

When the car again starts moving slowly after the traffic (0:33), the driver is still leaning forward and pressing buttons on the phone. Then we can hear the dial tone. The driver still orients to the phone and judging from the sound of the dial tone, she turns up the volume on the phone (0:36). After this she leans back, shifts the gear and starts picking up speed (0:38). After about 6 seconds, an answering machine answers the call. During the voice from the answering machine, the driver takes a gentle right-turn. During the turn, she starts to leave a message to the answering machine (0:57). While talking she picks up speed, right hand on the steering wheel and left hand on the gear stick. In line 15 (1:10), while she begins to end to the phone call, she moves her left hand to the steering wheel and her right hand to the mobile phone. After she stops leaving the message, she presses a button on the phone with her right hand, then turns the music back on with her left hand and resumes driving. She takes a quick glance at both technological devices as she uses them.

Summary

In all, the example shows and further confirms some of the findings made in previous examples. First, it shows that in addition to the fact that a conversation over a phone can distract the driver, drivers also engage in actions *before* the phone call that lead up to the actual phone call and which can also potentially distract the driver. Most visibly, these preparatory actions before the phone call occupy the driver's hands and also occasion her looking-away from traffic while searching for the phone, looking at the phone and while pressing buttons on it. Second, similarly with other examples, the driver clearly attempts to coordinate her distracting actions with the driving activity. That is, the more serious search for the phone, when the bag is on the passenger's seat and the driver really looks into the bag, co-occurs with the car's slowing down and being at a stop at an intersection. In other words, she begins to prepare for a mobile phone call when she can project a suitable moment in the driving activity for doing that. The dialling is done while being at a stop. However, similarly with many other examples, the end of the phone call co-occurs with free driving and the physical requirements for ending a phone call (e.g. pressing buttons on the phone) occur during driving. Third, the handsfree system does not prevent the driver from physically handling the phone or help her from not looking at the phone while using it.

3.2.2 Journeys with multiple occupants

3.2.2.1 Example 8: Passenger answers mobile phone

File: sun5apr1232pmfront

Driver: Male, established driver (>5 years experience)

Passengers: Three passengers his three teenage children, front seat passenger (FP) is male (age 16), passenger on rear seat right (behind driver) is female (age 18, oldest), passenger on rear seat left (behind front seat passenger) is male (age 13, youngest)

NOTE: 'Time' refers elapsed recording time, NOT to the time of day.

TIME	OCCUPANT	EVENT	DRIVING SITUATION
07:38	Dvr	initiates story of some junk email he has received, looking occasionally in RVM	free suburban driving
07:47	RRP	notices her mobile (cellular) phone is ringing, says 'oh shit', picks up phone	"
08:00	RRP	initiates talk with LRP	"
08:02	Dvr	turns around to look over left shoulder at LRP	"
08:15	RRP & LRP	RRP talking with LRP	"
08:16	RRP	talks on mobile phone	"
08:18	FP	makes proposal to Dvr for driving trip	"
08:24	Dvr	turns to look over left shoulder to look at LRP, talks to RRP about LRP	"
08:27	Dvr	turns head left to talk to RRP, RRP talking on phone to relay Dvr's talk to mobile phone caller	"
08:40	RRP	talks with LRP	"
08:41	Dvr	talks to RRP, leans head left towards rear passengers	"
08:42	RRP	continues talking on mobile phone	"
09:00	FP	calls out, announce names of two friends he notices walking along the roadside; points right in driver's field of vision to outside of car; Dvr looks left towards FP, then Dvr follows FP's pointing gesture to look right outside the car	"
09:02	RRP	passes mobile phone to LRP, tells him to talk to caller	"
09:08	Dvr	twice turns left to look at FP, talks to FP	"
09:10	RRP	talks with FP	"
09:19	Dvr	talks to RRP	"
09:33	FP	talks with RRP	"
09:33	Dvr	turns around to look over left shoulder at LRP	"
09:35	LRP	talks to caller on mobile phone	slowing
09:51	Dvr	turns to look over left shoulder to look at LRP	stopped

Transcription of conversation

In this example the most significant source of distraction is conversation between occupants, and so for the analysis it is important to present a detailed micro-transcription of the conversation, and to include details of non-verbal activity of both the driver and passengers.

Data: experienced male driver, >5 years driving experience. Three passengers, all teenage children of the driver. One passenger (boy 16yo) is seated in the front passenger seat, and two in the back seated left and right: 19yo woman is seated behind the driver, 13yo boy seated behind the front seat passenger. Music is playing throughout the recorded segment. The segment starts around 7:39 minutes into the journey.

Note: A '/' symbol shows the point where talk and non-verbal activity co-occur.

Transcription

1 Dvr: MATHIAS N I SAW A THING COME T THE COMPUTER YESTERDA/::↑Y (.2)
2 **/((Dvr looks towards rvm))**

3 Dvr /CAME T MY EM↑/AIL N SAID >YOU KNOW< MC/DON↑ALDS, (.) AS A VALUED MC/DONALDS
4 **/((RRP looks towards rvm))**
5 **/((Driver looks forwards)) /((Dvr looks towards rvm)) /((Dvr looks forwards**
6 Dvr /CUSTOMER↑ (0.3) />YOU KNOW, WOULD Y'< WOULD YOU LIKE TO
7 **/((Dvr looks towards rvm))**
8 **/((RRP looks forwards))**
9 Dvr PAR/TICIPATE IN THIS SU:R/VEY::, (.7/) U:/::M
10 **/((Dvr looks towards rvm))**
11 **/((Dvr looks forwards))**
12 **/((RRP looks towards rvm))**
13 **/((RRP leans forward and down to the floor))**
14 Dvr [AND Y-/YOU'LL GET A F-
15 RRP: [oh shit.
16 **/((Dvr looks towards rvm))**
17 (.6)
18 RRP: />sorry.<
19 **/((Dvr looks forwards))**
20 (.2)
21 Dvr [YOU'LL GET A FIFTY DOLLAR MEAL BONUS OR SOMETHING, (.2)
22 RRP [°my phone's ringing.°
23 Dvr: [IF YOU IF YOU COM/PLETE- (.) the ↓sur/vey.
24 RRP: [hello:?
25 **/((Dvr looks towards rvm then left towards FP))**
26 Dvr: /so I said t Mathias [do y really think /that everybody
27 **/((Dvr looks forwards)) /((Dvr looks left towards FP))**
28 RRP [oh we're almost at home↑
29 Dvr: who completes /the survey's gonna get fifty [bucks?
30 FP: **/((Dvr looks forwards, head turned slightly left))**

Transcription (cont)

31		[((coughs))
32	Dvr:	/in other words it's a virus.
33		**/((Dvr continues to look forwards, head turned slightly left))**
34		(.2)
35	RRP:	MATHIAS YOU'RE MEANT TO BE AT CHURCH REHEARSING.
36	Dvr:	**((Dvr looks over left shoulder towards LRP))**
37	LRP:	you se/rious?
38		**/((Dvr looks forwards))**
39	RRP:	apparently¿
40	Dvr:	/for what.
41		**/((Dvr looks towards rvm))**
42	RRP:	for what. {{**addressed to caller**}}
43	LRP:	the Friday thing. (.2) Good Friday thing.
44	RRP:	for Good Friday.
45	LRP	°(I didn't) know that.°
46	RRP:	that's why mum dad (.2) /to ask you if you had the script /and you said yes (.) °apparently.°
47		**/((Dvr looks towards rvm))** **/((Dvr looks forwards))**
48	LRP:	I said I had that at home.
49	FP:	you could drop him back off at church /when you drop me off at ( )
50		**/((FP looks right towards Dvr))**
51	RRP	well he ( ) well we're almost home
52	LRP	( )
53	RRP	an' he's got Nick coming over apparently,
54		(1.3)
55	Dvr:	/well he's gonna have t go home /an' ring Ni:ck,
56		**/((Dvr looks over left shoulder towards LRP))**
57		**/((Dvr looks forwards))**
58		(XXX)
59	Dvr:	/SO WE CAN BE BACK AT CHURCH IN:: FIFTEEN MINUTES
60		**/((Dvr looks left, looks forwards, looks left))**
61	Dvr:	/[IS THAT GONNA BE GOOD ENOUGH?
62		**/((Dvr leans left, looks forwards, head turned slightly left))**
63	RRP:	/[u::m mu-mu-mum dad says he can get Mathias back at church in fifteen minutes,
64		**/((Dvr leans left, looks forwards, head turned slightly left))**
65	Dvr:	/is that good enough [or is it gonna be finished by then.
66		**/((Dvr leans left, looks forwards, head turned slightly left))**
67	RRP:	[is that good enough? or is it not worth it.
68		**/((Dvr leans left, looks forwards, head turned slightly left))**
69	RRP:	well:: m::aybe they could call Nick or something.=what time's
70	RRP	Nick com[ing Mathias?
71	Dvr:	[>OH /WE< F'GET NICK WE /C'N CA:LL NICK (.) 'n:' put 'im off.
72		**/((Dvr lifts right hand from wheel, makes waving gesture))**
73		**/((Dvr puts right hand on wheel))**
74	RRP:	/well Timo' like they said they can propo- postpone Nick.
75		**/((Dvr looks forwards))**
76	Dvr:	uh heh UNLESS HE'S /WAITING /AT THE HOUSE. heh heh
77		**/((Dvr looks left))**
78		**/((Dvr looks forwards))**
79	RRP:	well they're rehearsing like no::::w.
80	Dvr:	oh Tim.

Transcription (cont.)

81 RRP: well mum says >there's another< rehearsal later in the week.
82 (1.6)
83 Dvr: w-aphh/
84
85 LRP: well I didn't know that. she's ma- (.) /she:'d (.) [remind me ( )
86 FP: IT'S MATTY AND SAM.=
87 RRP: =/TALK- TALK TO /HIM MUM. talk to him.
88 **/((FP looks right, leans forward, rises from seat))**
89 **/((Dvr looks left towards FP))**
90 FP: /it's MATTY AND SA::M.
91 **/((FP points with right hand towards rightside driver window, Dvr looks right towards driver's right window))**
92 LRP: /talk to mum Mathias. °you figure it out. °
93 **/((RRP hands phone left to LRP))**
94 RPl mum?
95 FP: /it's Matty and Sam.
96 **/((FP looks over right shoulder to RRP))**
97 FP: /☺ friends of mine.☺
98 **/((Dvr looks left towards FP, Dvr looks forwards))**
99 Dvr: /ah ha ha hh high(h)light of y' d(h)ay /e-he he.
100 **/((Dvr looks left towards FP)) /((Dvr looks forwards))**
101 FP: ( )
102 RRP: Josh Josh Josh [Phantom in Venice has outtakes.
103 Dvr: [I should pay them-
104 RRP we watched t the end of the credits¿ there's like outtakes like you turn that wheel thing and
105 the wheel just falls off¿
106 Dvr: [wha- what are you talking about.
107 RRP: [like guy::::s heh heh heh=
108 FP: =are you serious?=
109 RRP: =☺y(h)es.☺ .hh and like the pigeon? .hh fang goes leaning out the window to get the pigeon
110 [n' falls completely outta the window¿ .h heh he an' he's like ↑I'm ↑okay:::. ha ha
111 RPl: [mu:::m?
112 RRP: shit like that.
113 FP: well wha- (.2) did you /read on the net about the::: (.2) [( ) bathroom breaks?
114 **/((Dvr looks over right shoulder towards LRP))**
115 LRP: [alri::ght.
116 RRP [not- (.2) not really.
117 LRP: [so I don't ha- (X) wait mum wai::t:
118 FP: were there any other easter eggs,
119 LRP [um do y- do-you want me to come now? {{car is pulling into driveway}}
120 RRP: [ah::::: yeah.
121 LRP: [um do y- do you want me to come no:w?
122 FP: [( )
123 RRP: I found both of them. (X) the other one is if you get a gelato that's in the right order of the
124 Italian flag °*you get another easter [egg.*°
125 LRP: [okay. (.4) sorry mum. /love you. (.) bye.
126 **/((driver engages handbrake, Dvr looks over right shoulder towards LRP))**
127 (1.3)
128 Dvr: so what's happening?
129 LRP: she says don't worry there's one (.) Thursday after school (.) which should be fi::ne,
130 (.2)
131 /because >I don't have anything else on aft- Thursday< after school, and it's on early Friday
132 morning.
133 **/((driver looks forwards)) ((occupants are leaving the car))**

Potential distracting elements

- passenger uses mobile phone
- multiple conversations: conversations between passengers
- multiple conversations: conversations between driver and passengers
- passenger activity (pointing outside vehicle, handling objects)
- music playing

Summary of impacts on driving activities

- the journey destination becomes unclear i.e. an in-coming call to a passenger's mobile phone could change the journey's destination; the driver becomes involved in conversation relevant to determining the destination
- the driver looks in the rear vision mirror to converse with rear seat passengers
- the driver removes his hand from the wheel i.e. the driver makes a gesture during talk with a rear seat passenger
- the driver moves his body to converse with passengers: the driver leans left and turns his head to the left to listen to rear seat conversation, and to converse with rear seat passengers
- the driver looks away from the road – the driver turns left to converse with the front seat passenger
- the driver looks away from the road – the driver turning to look fully over his left shoulder, and shifting his body, to look at the left rear seat passenger
- the driver looks away from the road – the driver turns right to look at something outside the car during talk with front seat passenger

Discussion

As discussed in the literature review, previous driving research has studied driver conversation with passengers and showed how such conversations can distract driving. This example, which depicts an everyday family driving situation, further highlights the complexity of in-car conversation and its potential for distracting a driver from driving activities. The example shows how some conversation is initiated by the driver, some conversation involves the driver but is initiated by a passenger, some conversation occurs between passengers, and one conversation occurs between a passenger and a participant outside the vehicle (on mobile phone). So conversations may not involve the driver, or may involve the driver either directly or indirectly. The example shows how the driver participates in one way or another in perhaps five different conversations.

The example is highly complex and so the analysis here will highlight key features for understanding occurrence of in-car distractions.

The data: what happens

The details of the example can be glossed as follows. A father and his three teenage children (note: names have been changed) are driving home from church, which is a short journey of around 10–15 minutes. The mother has travelled there separately and has remained. One child (16yo) sits in the front with the driver, the other two sit in the rear at each side (see Figure 3). The example begins as the driver initiates a story about some junk email he recently received and had showed to one of the three children. This story follows immediately prior talk during which one of the children has told a story of a video file which is circulating and can supposedly kill you if you view it. As the driver tells his story, the rear passenger seated right, RRP, notices that her phone is ringing and answers it. Seconds later, just as the driver reaches his story's end and import ("in other words it's a virus", lines 32), the RRP turns left towards her brother Mathias seated also on the rear seat, LRP, and tells him that he is meant to still be at the church in order to rehearse for an upcoming Easter event ("Mathias you're meant to be at church rehearsing.", line 35). The children's mother has called

from the church from where they have left just a few minutes ago. The ensuing talk, concerning the impact of this news for Mathias's arrangements, involves all four occupants of the car, and also the mother over the phone. Specifically, talk revolves around the nature and practical implications of Mathias's commitment – does he need to return to church, can he return in time, and what is to be done about Mathias's friend Nick who is expected at Mathias's house for a visit soon after Mathias was due to return home?

Therefore the mother's call to her daughter's (RRP) mobile phone, with a message for her son Mathias (LRP) can therefore have direct implications for the current driving activity because one outcome may be a new destination: the driver may need to turn the car around and return to church for the rehearsal. This is what the participants' conversation here is seeking to resolve.

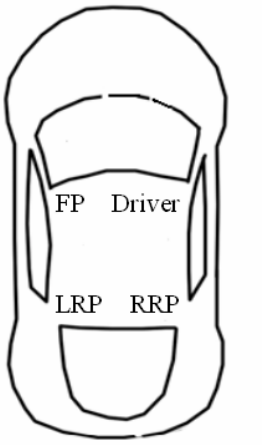

Figure 3: Location and description of participants within the car

We can also note some particular events and activities. At one point the RRP, apparently frustrated at having to relay messages between her mother (the caller), father (the driver), and her brother (Mathias, LRP), who appears to have forgotten a prior commitment, removes herself from the conversation by telling her mother "talk- talk to him mum. talk to him." (line 86) and handing the phone to her brother with "talk to mum Mathias. °you figure it out.°" (line 92). Having freed herself of her phone and negotiations for her youngest brother's commitments, the RRP launches a new direction for talk with her other brother Josh, travelling as the front seat passenger (FP), about a feature of a computer game she has recently played ("Josh Josh Josh 'Phantom in Venice' has outtakes", line 102). This exchange continues for the remaining few minutes of the journey. With his sister's phone in hand, Mathias discusses his dilemma with his mother, resolving it only as the car pulls into the home driveway. When the car has stopped, the driver engages the handbrake and asks him "so what's happening?" (line 128).

Also occurring in this example, just as RRP passes her phone to brother Mathias, the other brother, who is travelling as the front passenger, notices a pair of his friends walking on the footpath and verbally announces this excitedly with "it's Matty and Sa::m. …. friends of mine." (lines 86, 90, 95–97). The driver acknowledges with a tease (line 99), and also shifts his gaze direction from the road environment to look first towards the front seat passenger, who is noticeably moving in his seat, and then also outside the vehicle towards where the passenger is pointing.

Focus on distraction elements

The example shows some of the different and complex ways in which conversation(s) can potentially distract a driver, by for example directly involving the driver and the driving task. The

conversation is conducted in-car between passengers, and passengers and the driver, and is also conducted beyond the car as the passenger seated behind the driver talks also over the mobile phone. Here the very content of one of the multiple conversations concerns the destination, in that one outcome of the conversation is that the driver may have to turn the car around and return to their departure point. Evidence that the driver understands the potential significance of the conversation is that driver joins the conversation, and at key moments turns to look at the left seated rear passenger, whose activities of the day are the subject of the conversation. Another conversation also impacts the driver because the front seat passenger exclaims and points directly in the driver's left field of vision.

The conversations impact driving activities in a number of ways. When the driver is telling his story he looks occasionally in the rear view mirror (RVM) towards the RRP, or left towards the FP. We see also that the driver's gaze shifts according to the development of the conversation. It is when the driver realises that the RRP has answered her phone and is no longer attending to his talk that he turns left to look towards the front seat passenger as a hearer for his story. Therefore, a shift in driver's gaze is prompted by a shift in passenger participation in his conversation.

Significantly, this example shows the potential for distraction of *any* mobile phone in the vehicle, not just (use of) the driver's own phone. Here we see that the driver does not himself initiate or receive a call to his phone. However, a call received by a *passenger* leads to complex conversations which are directly relevant to the driving task – the destination for this driving journey – and which have demonstrable impacts on driving activities. When the RRP talks on her mobile phone, and talks with the LRP on matters arising from the call, the driver adjusts his body looking forwards while leaning left and turning his head to the left, or at two moments by looking fully away from the road towards the LRP. The course of the mobile phone conversation also prompts the driver to join in, and at one point emphasise a comment by making a waving gesture which involves removing his hand from the steering wheel. The driver shows ongoing evidence of participation in multiple conversations arising from the call. For example, the driver at times talks in direct response to the caller's talk, as relayed by the RRP who has taken the call, and this talk is directed as if to the caller, that is, to a participant who is not physically present in the vehicle. The driver also talks with the RRP and LRP.

The example shows how conversations can be highly unpredictable in terms of their timing and course of development, and can involve the driver in various and changing ways. The example also shows how participation in conversation can be manifest in various embodied behaviours, both for the driver and also the passengers. That is, the driver could not anticipate that the RRP would receive a call to her mobile phone which could have direct relevance for the driving destination. Nor could the driver anticipate that the FP would see two of his friends by the side of the road and shout and point to draw this to everyone's attention. When it is hearable that the conversation has implications for the journey destination, that the driver might have to turn the car around and return to the point of departure, the driver removes his eyes from the road, while in free suburban driving, and turns fully to look at the LRP, who is the focus of the conversation and whose involvement and response can resolve the issue. When the FP notices his friends walking by the side of the road he rises in his seat, which draws the attention of the driver who looks towards him, and then points right towards the driver's side window, which the driver follows by shifting his gaze direction.

The example is particularly valuable for highlighting the potential complexity of naturally-occurring conversation, and especially for the possibility of multiple conversations to occur either simultaneously or to emerge sequentially one from another, and to involve different participants in varying ways. The example also contrasts nicely with others. For example, while placing a handkerchief on the seat allows a driver to predict and prepare for a distraction (Example 2), here we have a distraction situation that *cannot* be predicted and prepared for. Some distractions can be predicted and some cannot, and this influences the ways in which the distractions can be handled and coordinated.

In this example we can note the following conversations emerging in the flow of interaction of the different car occupants, according to the principal participants and also the external participant calling by mobile phone. However, even this division hides some subtle detail of how different participants are actually involved (who's speaking to whom), and how they become so, and also the complex combinations for how the various 'conversations' emerge and relate to one another.

1. driver and all occupants (e.g. lines 1–14)
2. right rear passenger (RRP) and caller (e.g. lines 24,28, 42)
3. right rear passenger (RRP) and left rear passenger (LRP) (e.g. lines 35, 37, 39, 46, 48, 70)
4. driver and right rear passenger (RRP) (e.g. lines 44, 59, 61, 65, 69)
5. driver and caller (e.g. lines 40, 63, 67, 74) (as relayed through the RRP)
6. driver and left rear passenger (LRP) (e.g. lines 43, 45, 80)
7. left rear passenger (LRP) and caller (e.g. lines 94, 111)
8. driver and front passenger (FP) (e.g. lines 26, 29, 32, 49)
9. front passenger and all occupants (e.g. lines 86, 90, 95, 97)
10. right rear passenger (RRP) and front passenger (FP) (e.g. lines 102, 104, 107, 108, 109)
11. right rear passenger (RRP) and all occupants (22, 51, 53, 79)

The value of highlighting such detail is that it can begin to better reveal the nature and extent of the driver's participation in conversation(s), and so direct our analytic attention to how this participation may impact on driving activities.

Summary

All in all, this example provides a description of the potential complexity of emerging distractions. First, it shows that a ringing mobile phone does not have to be the driver's phone in order to impact the driver's actions. It seems that the ringing of any phone can impact the driver's actions. Second, it shows that several distractions can be related to each other sequentially, one (in this case a mobile phone call) giving rise to and making relevant a new one (a conversation over a possible change of plans and a new destination). Third, it shows that rather than being a participant in one conversation, the driver is in fact taking part in several conversations at the same time.

3.2.2.2 Example 9: Driver and passenger discuss possible traffic lights

File name: 21May942amFront

Driver: Male driver, >5 years driving experience

Passenger: Female front seat passenger

Ent. Sys.: No audio entertainment system

Driving situation

Free suburban driving, turns onto major arterial road.

Occupant information

Occupants are a married couple.

NOTE: 'Time' refers elapsed recording time, NOT to the time of day.

Time	Occupant	Action	Driving activity
04:25	Dvr	talks to FP; lifts left hand from wheel, moves hand to right, points to right, returns hand to wheel	Free suburban driving, limit 60kph

Time	Occupant	Action	Driving activity
04:26	Dvr	turns head left towards FP	"
04:27	FP	turns head right towards FP	"
04:28	Dvr	turns head left towards FP	"
04:29	Dvr/FP	Dvr talks to FP, FP replies, dvr continues talking	Makes a left turn into an arterial road (limit 80kph), accelerates, changes to right lane

Distracting elements

- conversation (front seat passenger)

Impacts on driving activities

- removes hand from wheel
- looks away from road to front seat passenger
- looks away from road to feature of external environment not related to driving activities

Transcription, begins 04:22, ends

1	Dvr:	;>I wonder what all< these things are for.
2		;((Dvr lifts left hand from wheel, moves slightly right, points to right, returns hand to wheel))
3		((Dvr turns head left towards FP))
4		((Dvr turns head forwards, FP turns head right to towards Dvr))
5		((FP turns head forwards, Dvr turns head left towards FP
6		((Dvr turns head forwards))
7		(1.6)
8	Dvr	°I'm° worried about th'm.=aren't you:?
9		(0.7)
10	FP:	u:m, (0.7) °re you worried th't they're seeing how much traffic [flow (there is);
11	Dvr:	[yeah:: yeah:.
12	Dvr:	they're not gonna to put /a traffic/ light he:re /quick/ly.
13		/((Dvr lifts right hand from wheel, waves quickly to left, returns hand to wheel))/
14	FP	°n(h)o:_ °
15	Dvr:	u-wh-who needs it,=it's only really guys turning right :there th't need it.
16		/((turns head slightly right, then forwards))
17		/((turns to look right))
18		/(0.6)
19		;((turns to look forward))
20	Dvr:	;an' it's hardly, /(0.8) necessary.
21		;((turns right. looks over right shoulder))
22		/((looks forward))
23		/(0.9)
24		;((looks left and up to RVM))
25	Dvr:	;mos:t >'f the time.</
26		;((looks forward, looks right to right side mirror))/
27		/(4.0)
28		;((looks right over right shoulder))

Discussion

This example involves conversation between the driver and his wife who is travelling as the FP. In particular, it shows how the driver coordinates talk with driving activities for a turning manoeuvre which is relatively demanding of attention. In short, the driver modifies his talk as it is delivered as he conducts the driving turn. In this situation it seems that the driver prioritises driving activities and so segments and delays the progress of his talk to fit the developing driving demands. This example shows how an in-car distraction (conversation) and driving can be managed in situ and moment-to-moment in real world driving. The example begins as the driver uses a feature of the passing visible external environment to initiate a topic for talk.

To summarise, the driver and FP have just finished a brief conversation and there is silence of a few seconds. The driver comments on something he has noticed in the external driving environment, rubber cable spread across the road to measure traffic flow. These are often used for data collection preparatory to new road works for traffic management, such as traffic lights. So here the driver is initiating conversation. The driver lifts his left hand from the wheel to point towards the feature he has noticed, and then twice turns left to look at the FP as he talks. These movements are all made very quickly, within a couple tenths of a second. As the vehicle approaches an intersection at a major (arterial) road the driver, where the driver will turn left, he continues to develop his line of talk but this does not demonstrably impact his driving activities.

So it is the driver here who is talking, and we can see here evidence of how the driver orients to the potential for conversation to be a distraction in how the talk is actually produced in real time and relative to the ongoing activities for driving.

First phase of example

In the first section of the transcription the driver notices the traffic flow measuring equipment and raises it as a topic for talk.

1	Dvr:	/>I wonder what all< these things are for.
2		**/((Dvr lifts left hand from wheel, moves slightly right, points to right, returns hand to wheel))**
3		**((Dvr turns head left towards FP))**
4		**((Dvr turns head forwards, FP turns head right to towards Dvr))**
5		**((FP turns head forwards, Dvr turns head left towards FP**
6		**((Dvr turns head forwards))**
7		(1.6)
8	Dvr	°I'm° worried about th'm.=aren't you::?
9		(0.7)
10	FP:	u::m, (0.7) 're you worried th't they're seeing how much traffic [flow (there is)
11	Dvr:	[y:eah::. yeah::.
12	Dvr:	they're not gonna to put /a traffic/ light he::re ↓su:rely.
13		**/((Dvr lifts right hand from wheel, waves quickly to left, returns hand to wheel))/**
14	FP	°n(h)o:. °

Simultaneous with talking about what he has noticed the driver very quickly (less than 0.2 seconds) lifts his left hand from the wheel and makes a pointing gesture to the right side of the road before returning his hand to the wheel. As it accompanies the talk the point can make available to the recipient FP just what 'these things' refers to, that the referent is recoverable as a feature of the external environment, what they are right now driving past. The driver initiates talk on a new topic, with a 'wondering', and although it is not quite a question (as in 'What are these things for?') his talk can project in response a candidate knowing or not-knowing response ('They are X', or 'I don't know what they are'). So it is the driver who initiates conversation as distraction, and as talk

initiating a new topic, and this topic is prompted by the driver's response to a feature of the passing external environment.

The driver's topic-initiating talk is associated with two gaze shifts left to look away from the road and towards the FP. First, immediately after completing his utterance, the driver looks away from the road to the FP. He begins returning to look forwards immediately after turning his head fully left, and just as she begins to turn right to look towards him. Immediately as her gaze is full right towards him she begins returning her gaze forwards, just as he begins turning left again to look towards her, so that they do not find themselves looking face-to-face. The driver's gaze shifts towards the FP are consistent with the conversational practice of looking towards an intended recipient for talk from whom a response would be relevant as next speaker. However, the FP does not respond in talk, but instead looks towards the driver. After 1.6 seconds of silence (line 7) the driver pursues a response by making explicit the upshot of his prior talk, that this is something to be 'worried about', and so the driver makes clearer what kind of response is relevant: '°I'm° worried about th'm.=aren't you::?". The tag question ('aren't you') projects a particular agreeing response, as for 'are you also worried?' So now the driver upgrades his interest from just 'wondering' (line 1) to 'worrying' (line 8). It would seem that the driver is pursuing the FP for a response, for reciprocating by giving her own interpretation of the noticed traffic measuring equipment.

In ordinary (non-driving) conversation a speaker might maintain gaze with a recipient to select them as next speaker, to make it visibly apparent that a response is called for. Here however we see that the driver orients to the need to maintain visual contact with the road and so does not sustain looking at the FP, but looks at her only briefly before returning his gaze forwards to the road ahead.

In terms of distraction for driving, the point to highlight here is that the development and embodied production of the driver's talk, offering further talk and also looking twice towards the FP, is apparently occasioned by the nature of the FP's response. That is, the passenger's look, without talking, prompts the driver to look away from the road towards her, for evidence of her response. The driver shows evidence of primary orientation to driving, but through coordination with conversation, therefore to manage the potential for conversation to be a distraction.

After briefly pointing to the traffic flow measuring equipment, the driver removes his hand from the wheel a second time (less clear on video recording) as the vehicle approaches an intersection and the driver identifies a possible reason for the possible activity to measure traffic flow. Perhaps there are plans to install traffic lights at the intersection?

12	Dvr:	they're not gonna to put /a traffic/ light he::re ↓su:rely.
13		**/((Dvr lifts right hand from wheel, waves quickly to left, returns hand to wheel))/**
14	FP	°n(h)o:. °

As before, the driver's talk is accompanied by a waving gesture which can establish the referent for the deictic 'here', the place they are driving through right now, and locating for the recipient something in the surrounding environment. The passing environment occasions the driver's talk, in that the driver treats this moment, as they approach and enter the intersection, as the relevant time to comment and gesture. The driver's wave gesture is made expeditiously, not sustained. It is not designed to maximise its witnessability and to best allow its recipient to follow its trajectory to the target (Nevile 2007). Instead, the driver's hand returns immediately to the steering wheel for executing a forthcoming turn.

Second phase of example

For analysing the next phase of the example it helps to know something of the road and driving situation faced by the driver. This will inform the analysis and understanding of what is occurring.

The driver is at first driving through his home suburb, on a road that runs through the centre of the suburb from one entry/exit point of the suburb to another, on a road to which other smaller roads connect. This road joins directly to main (arterial) roads in four directions, and these arterial roads then connect the suburb to other suburbs and form the routes to the major district shopping city centres, or onwards to the city centre. As a suburban road the maximum speed limit is 60 kph, and the arterial roads to which it connects are all 80 kph.

In this example the vehicle approaches an intersection for one of these arterial roads and the driver turns left. It is important to know that the left turning lane on which the focus vehicle is travelling becomes after the turn a third lane of the arterial road - which had only two lanes at the intersection. Also, for the first 30 metres or so this new lane is protected by a solid white line road marking to indicate that vehicles cannot cross. This is intended to retain vehicles in their lanes long enough for drivers to notice one another and adjust before making new manoeuvres, as the turning traffic joins traffic already on the arterial road (see Figures 4 and 5).

In principle then, a vehicle here should be able to turn left with confidence because the driver does not need to give way or stop. Indeed stopping or slowing significantly risks a collision from behind because these are not necessary actions and may not be expected by immediately following drivers. However, drivers making this left turn do so with caution because they cannot assume that the solid line protecting 'their' lane will be respected by drivers already on the arterial road, who may be interested in shifting into the left most lane to make a left turn at a major intersection just a few hundred metres further on. A vehicle turning here is joining faster and potentially conflicting traffic. A driver turning left here must smoothly join the new road and begin to increase speed to match the flow of traffic. Also, drivers turning here must watch for other turning drivers ahead who may slow or stop necessarily. It is an intersection which requires caution, and indeed a local cycle association describes it as a 'difficult' intersection for cyclists to negotiate.

Figure 4

Figure 5

We see evidence in this example of the driver exercising such caution, with very active looking to his right, to his right mirror, into his rear view mirror (RVM), and also over his right shoulder. Making a left turn means that possibly dangerous merging traffic can come from the right if vehicles incorrectly merge too soon into the driver's left lane.

The analysis here considers how the driver exercises caution while executing the turn, and manages this driving activity while simultaneously talking to the FP by continuing a topic begun a few seconds earlier as the vehicle first approached the intersection.

The main point here is that this is a very difficult intersection, and while driving at that intersection the driver is engaged in a conversation. The conversation might distract the driver from driving activities, but he is seen to coordinate his talking with the driving activity at the intersection. This is a driving situation that can call for significant attention, however we see at first glance that the driver does not stop talking while the turn is in progress. We see also that the driver is well into a long (extended) turn at talk. So far, when approaching the intersection and the forthcoming left turn, he has expressed only a form of disbelieving noticing: "they're not gonna to put [a traffic] light he::re ↓su:rely.". As he continues, with so far only a minimal verbal response from the FP (a softly spoken 'no': "ºn(h)o:.º), he makes it apparent that his noticing is disapproving, that he is presenting a complaint for which he makes the grounds explicit: a traffic light here would be unnecessary. It is that part of his talk which he embarks on just as the vehicle reaches the point for turning left. Despite the difficult intersection and the possible demands it poses for driving, the driver pursues and develops the conversational topic in the light of the passengers' apparent minimal agreement - but the driver is able to coordinate the conversation with the driving.

The transcription shows how the driver integrates his emerging talk with the driving activities required for the intersection manoeuvre. Specifically, we see how the driver modifies (segments) the delivery of his talk (e.g. with pauses) to coordinate it with (allow for) the demands of the driving.

12	Dvr:	they're not gonna to put /a traffic/ light he::re ↓su:rely.
13		**/((Dvr lifts right hand from wheel, waves quickly to left, returns hand to wheel))/**
14	FP	°n(h)o:. °
15	Dvr:	u-wh-who needs it,=/it's only really guys turning r:ight /there th't need it.
16		**/((turns head slightly right, then forwards))**
17		**/((turns to look right))**
18		/(0.6)
19		**/((turns to look forward))**
20	Dvr:	/an' it's hardly, /(0.8) necessary.
21		**/((turns right, looks over right shoulder))**
22		**/((looks forward))**
23		/(0.9)
24		**/((looks left and up to RVM))**
25	Dvr:	/most >'f the time.</
26		**/((looks forward, looks right to right side mirror))/**
27		/(4.0)
28		**/((looks right over right shoulder))**

So here we see that the driver maintains a flow of talk throughout the potentially demanding turn without impacting driving activities, and instead it is the flow of talk which is impacted. This is clear interactional evidence for how driving is coordinated with conversation. As he enters the turning lane to make the left turn he says "u-wh-who needs it,=/it's only really guys turning r:ight /there th't need it.". This is a potentially complete turn and presentation of the driver's view. However, as he executes the turn the driver adds more by saying "/an' it's hardly, /(0.8) necessary. … /most >'f the time.</ (lines 20–25). This addition is presented in two parts, the first of which could be heard as complete at the end of "/an' it's hardly, /(0.8) necessary." which is said with completing terminating intonation (indicated by the '.'). However the driver adds a qualifying increment, with "most >'f the time.</".

We see that the additions to the talk are presented as staged with coordination with looking activities necessary to execute the turn. After looking right, then forwards, then right again during and immediately after saying while saying "/it's only really guys turning r:ight /there th't need it.", the driver turns to look forwards during 0.6 of a second without talk, before again looking right when adding "/an' it's hardly, /(0.8) necessary.". The driver again ceases talking, for 0.9 of a second while he looks towards the rear view mirror, before adding "/most >'f the time.</" as he again shifts gaze forwards and then to the right side driver's mirror.

Summary

Here the driver's segmentation of his emerging talk with silence is coordinated with looking activities necessary for executing the intersection turn. Although in this segment conversation with a passenger about a feature in the environment is a potential driving distraction, the analysis shows how the driver coordinates his driving activities at the intersection so that the driver's talk is affected by the driving, rather than the demands of interaction negatively impacting driving activities. For this driver at this moment driving activity remains the activity to which the driver is primarily oriented.

3.2.2.3 Example 10: Driver tells work story

File: thur7May512pmFront

Driver: Female driver, established (>5 years driving experience),

Passengers: Adult male passenger (husband)

Duration: approx: 2 mins 38 seconds

Driving situation

Slow driving within an institution's grounds, then free driving on 60kph road.

Location

Driving begins within the grounds of a large institution (max. speed 20kph) (the first 2 mins 12 seconds), then continues on a main road (max. speed 60kph).

Note: 'Time' refers elapsed recording time, NOT to the time of day.

FRONT CAMERA

Time	Occupant	Action	Driving activity
14:57	Dvr/FP	Passenger has just entered the vehicle, driver begins to tell story about day at work, passenger asks about the story	Stopped, then slow driving in car park including reversing and three point turn
15:26	Dvr	Talks about day at work, shifts gear, moves left hand to head to groom hair, puts hand to mouth	Slow driving on roads within institution max. 20kph zone
15:30	Dvr	Continues telling story, makes waving gestures with hand (8 seconds)	Slow driving on roads within institution max. 20kph zone
15:38	Dvr	Continues telling story, returns left hand to wheel	Makes right turn
15:39	Dvr	Continues telling story, lifts right hand from wheel, gestures by pointing over right shoulder	Completes right turn
15:41	Dvr	Continues telling story, moves right hand to wheel	Initiates left turn
15:42	Dvr	Continues telling story, lifts left hand from wheel, gestures with left hand	Completes left turn
15:49	Dvr	Continues telling story moves left hand to wheel	Initiates left turn
15:50	Dvr	Continues telling story, lifts right hand from wheel	Making left turn
15:51	Dvr	Continues telling story, moves right hand to wheel	Making left turn
15:52	Dvr	Continues telling story, shifts gear with left hand	Completing left turn
15:53	Dvr	Continues telling story, moves left hand to wheel	Initiates right turn

Time	Occupant	Action	Driving activity
15:54	Dvr	Continues telling story, moves left hand from wheel to leg	Making right turn
15:55	Dvr	Continues telling story, lifts left hand from leg to make waving gesture	Making right turn
15:58	Dvr	Continues telling story, moves left hand to shift gear	Completes right turn
15:59	Dvr/FP	Continues telling story, lifts left hand to make waving gestures (7 seconds), FP responds to story (“wow”)	Driving straight and slowly within institution
16:06	Dvr	Continues telling story, Moves left hand to shift gear	Driving straight and slowly within institution
16:08	Dvr	Continues telling story, Moves left hand to leg/lap	Driving straight and slowly within institution
16:12	Dvr	Continues telling story, lifts left hand to make waving gestures (4 seconds)	
16:16	Dvr	Continues telling story, shifts gear, moves left hand to wheel, shifts gear, moves left hand to wheel	Makes left turn, makes right turn
16:32	Dvr	Continues telling story, lifts hand from wheel, makes waving gestures (3 seconds)	Completing right turn
16:35	Dvr	Continues telling story, shifts gear, adjusts sun shade	Straight slow driving
16:39	Dvr	Continues telling story, moves left hand to wheel	Straight slow driving
16:43	Dvr	Continues telling story, lifts left hand from wheel, makes waving gestures (2 seconds)	Straight slow driving
16:45	Dvr	Continues telling story, shifts gear	Straight driving, accelerating
16:47	Dvr	Continues telling story, lifts hand from gear stick, makes waving gestures (5 seconds)	Straight driving
16:52	Dvr	Continues telling story, shifts gear, FP asks about story	Slowing
16:54	Dvr	Responds to FP’s question, continues telling story, lifts both hands from the wheel, lifts both arms with open palms, makes waving gestures with both hands (3 seconds)	Stopped
16:57	Dvr	Moves right hand to wheel, moves left hand to leg	Stopped
16:59	FP	Asks about story	Stopped
17:00	Dvr/FP	Adjusts sun shade, FP elaborates question, Dvr responds	Stopped
17:02	Dvr	continues talking, makes waving gestures with both hands (4 seconds)	Stopped
17:06	Dvr	Moves right hand to wheel, moves left hand to leg	Stopped
17:07	Dvr	continues talking, lifts left hand, makes waving gestures, moves hand to mouth	Stopped

Time	Occupant	Action	Driving activity
17:09	Dvr	Right hand on wheel, left hand shifts gear	Starting and moving off
17:12	FP	Asks dvr about story, dvr shifts gear	Turning right while moving off from lights
17:16	Dvr	Responds, lifts hand from gear stick, waving gestures	Completing right turn
17:20	Dvr	Returns left hand to wheel, continues talking	Free straight driving
17:21	Dvr	Continues talking, lifts left hand from wheel, makes waving gesture, moves left hand to shift gear	Free straight driving
17:22	Dvr	Continues talking, returns left hand to wheel	Free straight driving
17:23	Dvr	Continues talking, uses right hand then left hand to adjust sleeves on each arm	Free straight driving
17:25	Dvr	Continues talking, left hand makes waving gesture	Free straight driving
17:26	Dvr	Continues talking, left hand shifts gear	Free straight driving
17:27	Dvr	Continues talking, left hand makes waving gestures (7 seconds)	Free straight driving
17:34	Dvr	Continues talking, returns left hand to wheel, turns left to look at FP	Free straight driving
17:35	Dvr/FP	Continues talking, looks forward, FP says "wow"	Free straight driving

Distracting elements

- conversation with front seat passenger
- grooming (hair, adjusts sleeves)

Impacts on driving activities

- removes hand from wheel
- looks away from road towards front seat passenger

Discussion

This example shows the kinds of embodied actions potentially involved in conversation as distraction, and the impact of these actions on driving activities. Specifically, the driver is telling an extended story about a difficult event at her workplace. Throughout the telling the driver repeatedly lifts her left hand from the steering wheel, or sometimes her right hand from the steering wheel, to make waving type gestures to accompany the story's telling. The driver occasionally turns left to look at the FP. As the driver tells the story the FP, as the story's recipient, says very little, only some questions for clarifying and probing the events or to offer one-word recognition responses (e.g. "wow"). The example shows how using gestures while talking can lead to frequent and extended periods when the driver has only one hand on the wheel.

In the 2:38 minutes duration of this segment, the driver makes waving gestures or does grooming activity, when lifting a hand (mostly left) from the wheel, or not returning a hand to the wheel after shifting gear (e.g. 15:30, 15:59), a total of 17 times and for a total of at least 36–40 seconds (including some time stopped at traffic lights, 16:54). The longest times driving with only one hand were for around 8 seconds and 7 seconds, other moments were for as little as a second.

So the example highlights how conversation can create demands not only on the driver's auditory and mental attention, but also on the driver's embodied involvement in and for driving. In this case the driver spends significant amounts of time driving with one hand not on the wheel and busy in non-driving activities. The conversation is led by the driver in that the driver is engaged in an extended story-telling.

We can also note some interesting details about exactly how the gestures while talking impact driving activities. The segment begins when the vehicle starts off and moves slowly through the grounds of a large institution where the roads are a maximum speed limit of 20kph. The driver begins to talk about a dramatic end to her day at work. After moving her left hand to shift gear she continues moving her left hand to her head to groom her hair. She does not return her hand to the wheel, but instead she begins to accompany her story with hand waving gestures. Evidence that the gestures form for the driver an integral part of the story telling is that she resumes gesturing very quickly after each driving task.

Indeed, we see the driver *switch* gesturing hands to fit around the demands of turning. For example, from 15:30 the driver uses her left hand to gesture while talking. Many seconds later, at 15:38, the driver returns her left hand to the wheel as she initiates a right hand turn, then as she completes the turn at 15:39 she lifts her *right* hand from the wheel and continues to gesture. Soon (15:41) she is initiating a left turn and returns her right hand to the wheel before then completing the turn at 15:42 when again lifting her *left* hand from the wheel to maintain gesturing while continuing the story. So the driver switches the gesturing hand twice in order to continue *both* the driving activity (manipulating the wheel for a turn) and the gesturing for the verbal story.

We see the same pattern later, for how the driver integrates her use of the story telling gestures with the demands of shifting gear and manipulating the steering wheel as she negotiates a number of small turns. For example, at 15:58 the driver is making a right hand turn and returns her left hand to the wheel. As she completes the turn with her left hand (15:39) she lifts her right hand from the wheel, and gestures over her right shoulder. When she next initiates a left turn, she returns her right hand to the wheel and lifts her left hand from the wheel to continue gesturing while completing the turn (15:42).

When the driving moment allows, the driver *upgrades* her gesturing by using *both* hands simultaneously (16:54). When the vehicle stops at a red light at an exit of the institution, the FP asks about a detail of the story. The driver responds, and does so by lifting *both* hands from the wheel and raising her arms with palms open as she emphasises the significance of the content of her talk. So the moment the driver does not need any hands to drive, while beginning a wait at lights, the driver takes the opportunity to upgrade her gesturing by using both hands, when previously driving activities had demanded at least one hand to remain on the wheel.

To emphasise this point, we can see that the driver makes her story-telling gesturing not just when driving in a straight line, or while in a stable gear configuration, but as integrated with the driving activities of turning or shifting gear. Throughout the first 2 minutes 38 seconds of the example the driver performs many turns and gear shifts, and we see how she moves her hands smoothly between the wheel, gear stick, and gesturing in the space in front of her body.

Also, it should be noted that the driver does not only gesture actively while slow driving within the 20kph limit of the grounds of a large institution. We see that after stopping at a red light at the institution's exit, and then turning right onto a main road, the driver continues to tell her work-day story while accelerating towards the new 60kph limit (from 17:16). She again lifts her hand from the wheel to produce waving gestures to accompany her telling (17:16), including for an extended duration of 7 seconds (from 17:27).

The example also includes two instances of grooming. As the example begins (15:26) the driver shifts gear and then lifts her left hand to her head to move her hair from her face, before then

initiating an 8-second extended period of gesturing as she begins her story (15:30). Later, while in free driving outside the institution, she adjusts both her sleeves, first the right hand to adjust her left sleeve, then the left hand to adjust her right sleeve. The left hand then does not return to the wheel but immediately moves to make a rapid wave gesture (17:25) before moving to the gear stick to shift gear (17:26). So the driver shifts gear after completing hand activities for consecutive distracting events (grooming, then gesturing), while maintaining a continuous flow of talk to tell her story.

Many studies on driving distractions have considered driver-passenger conversation in cognitive terms, that conversation is a cognitive form of distraction to driving (McCarley et al. 2004; Horrey, Lesch and Garabet 2008). This example supplements such research by showing how gestures and other forms of embodied interactional behaviour can impact driving activity. During conversation, drivers can for example lift one or both of their hands from the steering wheel. However, this example also shows how such gesturing is not haphazard but is coordinated with the simultaneous driving activity. In sum, conversation can have not only a potential cognitive impact but through gesturing also an embodied impact on driving activity.

Summary

This example is important because it demonstrates clearly another element of conversation, in addition to its verbal element, that impacts driving: *embodied* actions. Interactants gesticulate, and such gesticulation is coordinated with the demands on the hands for driving (e.g. handling the steering wheel). Indeed, it is possible that such non-verbal conduct may be even more directly influential than talk for actual physical demands of driving.

3.2.2.4 Example 11: Dog falls off rear seat

File name: Thurs7May909amfront

Driver: Male driver, experienced (>5 years driving experience)

Passenger: Female adult front seat passenger (wife), one dog

Occupant information

Occupants are a married couple.

Dog sitting on folded down rear centre passenger seat.

TIME	OCCUPANT	EVENT	DRIVING SITUATION
09:00	Dvr, FP	conversation between Dvr and FP, FP asks question, FP turns right to look at Dvr	free suburban driving
09:14		loud crash as dog falls onto floor from rear seat	initiates left turn at T-intersection
09:16	Dvr, FP	Dvr and FP look rearwards towards source of sound	free suburban driving
09:18	Dvr, FP	conversation about dog	free suburban driving

Transcription

FP remember there used to be an old (.) s-scungey **((FP turns left to look at Dvr))** gym there?
Dr yep.
(0.2) **((FP turns to look forward again))**
Dvr: I remember going there I think they (.) charged us (0.2) eighteen dollars f'r an hour or something and it was jus' disgusting rusty and dirty an',
(3.0)
((loud crash sound from inside rear of car – the dog has fallen off the seat, onto the floor behind driver's seat))
FP: oohh **((FP and Dvr turn head to right to source of sound, where dog has fallen, Dvr turns head forward again))**

FP: heh heh ((laughing)) **((Dvr turns head right to look over right shoulder to source of sound))** Cleo.
Dvr: hh hh ((laughing))
FP: hh hh hh hh ((laughing))
Dvr: I ta(h)ke it tha(h)t was the d(h)og.
FP: tha(h)t wa(h)s the do(h)g
Dvr: hh heh ((laughing)) what'd she do ( )?
FP: she fell.
Dr: sh I wasn't even ↑trying .hh
FP: hh hh hhe ((laughing))

Potential distracting elements

- conversation between driver and front seat passenger
- dog on rear seat
- unexpected in-car event - dog falls off seat onto floor
- music playing

Impact on driving activities

- in rapid succession the driver twice looks right over his shoulder towards the sound and away from the road, while executing a turn

Discussion

In this example, lasting around 30 seconds, a dog falls off a rear passenger seat and this claims the attention of both car occupants. The driver and front seat passenger turn to look towards the source of the sound, where the dog has fallen. The dog and its fall then become the subject of laughter and conversation and joking between the two occupants.

Before the dog falls the two occupants are engaged in conversation about their visit to a gym which once stood where apartments are now, and which they have just driven past. The dog falls from the folded down rear middle seat, apparently (evident from the sound) first impacting the right passenger door and then landing on the floor directly behind the driver's seat. Both front seat passenger and driver react immediately and simultaneously to the dog's fall, by turning their heads right towards the source of the sound. The passenger initially exclaims "oohh", which can be heard as indicating her talk is not part of the current ongoing conversation, but is instead prompted by the sound which signals an unexpected in-car event. By turning right the front seat passenger can look directly at the dog where it has fallen. It seems the dog is OK because the front seat passenger

begins to laugh. The driver turns his head to the right to look past his shoulder, in direction of the right rear passenger door which the dog has impacted. However, the driver cannot see the dog because it has fallen directly behind the driver's seat. While driver and passenger laugh the driver turns his head to the right a second time. The dog then becomes a focus of laughing and joking conversation between the two occupants.

The dog's fall directly accompanies the driver's initiation of a left turn at a T-intersection. The driver makes the turn without stopping and so it seems that the car's movement has caused the dog to fall. The distraction is therefore prompted by a feature of the driving situation.

In terms of distraction, the dog's fall impacts driving activities by prompting the driver to twice look right and away from the road ahead while executing a left turn and resuming straight driving. Also, the dog and its fall become the subject of subsequent conversation between driver and passenger. The dog's fall immediately draws the attention of both occupants.

Summary

This example shows how one distraction can occur relative to another: the dog's fall occurs during an unrelated existing conversation. The example shows how an unpredictable distraction can develop as an ongoing distraction: the dog's fall becomes the subject of ongoing conversation. The example shows how an unpredictable in-car event can develop quickly as a distraction and impact activities for driving (i.e. looking towards the relevant road environment). Distractions are not static, but dynamic, they are situated and can emerge from previous actions and events.

3.2.2.5 Example 12: Driver eats, talks on mobile phone

Data from: "Habitable cars" by Eric Laurier

File: Phoning and feeding.mov

Duration: approx. 4 minutes

Driving situation

Suburban city driving with pedestrians and other traffic.

Occupant information

Female driver, (established driver), no front seat passenger, two children passengers in the back; the driver has picked up two children from school; many pedestrians walking across the road, narrow road, many cars.

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
0:14	Dvr	Starts the engine	Stopped
0:14	RRP	Talking on the phone (handsfree) to mother	Stopped
0:16	Dvr	Removes the hand break, applies the gears, looks in the mirrors, music starts from the CD player.	Stopped

Time	Occupant	Action	Driving activity
0:18	Dvr	Reverses the car, looks in the rear view mirror	Reversing the car slowly
0:23	Dvr	Applies the indicator, initiates a take-off, looks in the side mirror	Starts to move forward slowly
0:27	Dvr	Looks out of window, her left	Moving slowly
0:28	Dvr	Waves to a pedestrian (duration: 1 second), one hand off the wheel	Moving slowly
0:34	Dvr	Turns head left to seat (1 second)	Slow intra-city driving, begins to slow down again, traffic stopped ahead
0:35	Dvr	Checks traffic and looks back at the seat (three seconds), one hand off the wheel	Slowing down
0:38	Dvr	Looking at traffic ahead, picks up a sandwich	Almost stopped
0:39	Dvr	Looks at entertainment system, switches music off	Almost stopped
0:44	Dvr	Opens the sandwich from package, hands the sandwich the other child in the back (4 seconds)	Stopped
0:48	Dvr	Adjust the camera, car in front starts moving	Stopped
0:49	Dvr	Looks down	Stopped
0:50	Dvr	Looks forward	Moves off, picks up speed slowly
0:53	Dvr	Looks down, to pick up another sandwich (2 seconds)	Starts to slow down
0:55	Dvr	Looks down, takes out a sandwich from wrapping (2 seconds), takes hands off the wheel	Almost stopped and then stopped
0:57	Dvr	Fiddling with the sandwich, looks at traffic, car in front starts moving (1 second), hands off the wheel, one hand off the wheel	Stopped and starts moving slowly
0:58	Dvr	Looks down at sandwich (less than a second), both hands off the wheel	Moving slowly
0:59	Dvr	Fiddling with the sandwich, looks at traffic, hands off the wheel (2 seconds)	Moving slowly
1:01	Dvr	Puts sandwich away, looks at traffic, one hand on wheel (1 second) (approaching a pedestrian crossing)	Moving slowly
1:02	Dvr	Puts other hand on wheel, removes the other, eats (16 seconds)	Moving slowly, driving across a pedestrian crossing, slows down and stops
1:13	Dvr	Looks in the RVM	Stopped
1:18	RRP	Talking on the phone	Stopped
1:19	Dvr	Comments on the phone call (comforts the child), eats	Stopped
1:58	RRP	Ends the phone call	Slowing down

Time	Occupant	Action	Driving activity
1:59	Dvr	Says that the other child wants to talk on the phone too	Slowing down
2:00	RRP	Children organise to switch the speaker with the handsfree equipment	Free and slow intra-city driving (slow)
2:04	Dvr	Laughs at kids working on the handsfree, comments on that (3 seconds)	Picking up speed
2:07	Dvr	Head turn to left, looks back at children using the handsfree system (1 second) (approaching a pedestrian crossing)	Free intra-city driving
2:10	Dvr	Head turn to left, looks back at children using the handsfree system (1 second) (at the pedestrian crossing)	Free intra-city driving
2:12	Dvr	Makes a comment to the person at the other end of the phone (that the child is eating); note the driver is not on the phone	Free intra-city driving
2:18	Dvr	Initiates left-turn with indicator	Initiating a turn, slowing down
2:19	LRP	Requests for something to eat	Slowing down
2:22	Dvr	Looks at front seat (3 seconds)	Stopped
2:25	Dvr	Looking down, picks up a lunch box (1 second)	Stopped
2:26	Dvr	Looks down, opens the lunch box, both hands off the wheel (2 seconds)	Stopped
2:29	Dvr	Looks down at lunch box, puts lid away and gives the box to the backseat, not looking at traffic (3 seconds)	Stopped
2:32	Dvr	Car in front moves off and turns left, dvr looks up, still handing over the lunch box to the backseat, talking to the kids (2 seconds), dvr still stopped while handing the box and talking to RRP	Stopped
2:35	Dvr	Talking to RPs, approaching an intersection	Moving slowly
2:55	Dvr	Looks at the backseat (1 second)	Free intra-city driving
2:58	LRP	Talks to driver; about giving the handsfree away	Free intra-city driving
3:01	Dvr	Looks at the backseat (less than a second)	Free intra-city driving, slowing down
3:02	LRP	Talks to driver, indicating that he has stopped talking on the phone; takes off the handsfree system	Slowing down
3:03	Dvr	Responds to passengers, shifts gears	Free intra-city driving
3:03	Dvr	Stretches her arm to the backseat to get the mobile phone, prepares for turn, applies the indicator (with other hand, hands off the wheel) and puts the ear piece into her ear.	Free intra-city driving, slowing down

Time	Occupant	Action	Driving activity
3:08	Dvr	Initiates right-turn with indicator, handling the hands-free system	Initiating a turn
3:09	Dvr	Answers the phone	Preparing for a turn
3:10	Dvr	Listening on the phone (15 seconds)	Makes the right-turn across traffic, after turn congested traffic at the intersection, stopped
3:14	Dvr	Continues listening on the phone, turns the wheel to the right	Turns to the right
3:15	Dvr	Reaches back to the backseat to get the mobile phone device; is not able to grab it. Children are trying to hand her the box with fruits (misinterpret her intentions)	Driving through the intersection
3:25	Dvr	Talks on the phone (5 seconds)	Stopped at the intersection, waiting for oncoming traffic
3:30	Dvr	Listening on the phone	Picking up speed
3:35	Dvr	Talks on the phone (10 seconds) – then phone call ends	Picking up speed
3:47	Dvr	Dvr talks to passengers, requests the phone, shifts gears, one hand off wheel	Slowing down
3:48	Dvr	Reaches her hand to the back (2 seconds), turns her head to the left at the same time (1 second), approaching intersection	Slowing down
3:50	Dvr	Applies indicator with right hand, no hands on the wheel, shifts gears with other hand	Slowing down
3:51	Dvr	Reaches her hand back again	Preparing for a turn
3:53	Dvr	Child hands her the phone, one hand on wheel	Preparing for a turn
3:54	Dvr	Puts the other hand on the wheel, looks at the phone quickly	Turns at the intersection
3:56	Dvr	Looks at the phone (on right hand), left hand on wheel (1 second)	Free intra-city driving, approaching another intersection
3:57	Dvr	Quick glance at traffic, looks at the phone again (almost 2 seconds)	Approaching intersection, slowing down
4:00	Dvr	Looks up, looks at traffic, applies the indicator	Stopped at the intersection
4:03	Dvr	Looks at phone (almost 2 seconds), makes a phone call	At the intersection, preparing for a turn, waiting for traffic, stopped
4:04	RRP	Starts talking to dvr (uses first name)	At the intersection, stopped
4:05	Dvr	Answers the passenger, asks her to wait (the phone call)	At the intersection, stopped
4:09	Dvr	Fiddles the handsfree, attaches it to her jacket (3 seconds)	At the intersection, stopped
4:14	Dvr	Talking on the phone	At the intersection, starts moving
TAPE ENDS			

Transcription

RRP: Uhm, **((talking on the phone))**
LRP: Mummy,
RRP: Sha=nt, I, uhm, I was in Shansbury? **((car starts))** (0.6)
Jean was in my [( )]
ENV: [**((music starts from CD, continues from this point onward, driver reversing the car))**]
RRP: [Yeah.]
DRV: [**((applies the indicator))**] (4.0) **((waves hand))** (0.6)
((glances right at seat))
LRP: (Hold it, mum[my]) **((glances again at the seat))**
RRP: [Ma]=, are you coming- (.) Are you going today:::. **((dvr switches the CD off))**
(1.4)
RRP: No=o. [[quietly]] **((dvr opening a packet))**
(1.4) **((dvr hands the sandwich over to LRP))**
LRP: [[makes [a vocal] sound]]
DRV: [Here Noah.]
RRP: ( )
(3.0) **((dvr adjusts the camera))**
RRP: Yeah, but I don't know what she likes. **((dvr looks right at seat))**
(4.9) **((dvr opens another packet))**
RRP: I drew (o:::ne).
(3.0)
RRP: I drew o::ne. **((dvr eats))**
(10.3) **((dvr checks face on RVM))**
RRP: Ma::.
(1.3)
DVR: It's OK Macy.
(2.1) **((dvr eats))**
RRP: .hh (I wa-)
(1.6)
RRP: Mum, I wan- I want to do some-
(1.9)
RRP: How can we dr- draw tha::t:.
(5.7) **((dvr waits for a person to get out of a car))**
.hh Yeah,(.) can we [( ])
DVR: [Uh.]
(16.8)
RRP: OK, bye bye.
DVR: Joel wants to say hello too.
RRP: (.) Joel.
(1.0)
RRP: Put this in your ear, and hold it [in your ear].
DVR: [hahha hahha hahhah]haha hold it in your ear, [.hhh
LRP: [( )]
(3.2) **((dvr looks back))**
LRP: Hi Mum. **((dvr looks back again))**
DVR: H(he)e (he)is eating Mary hihhih hehah hahhah ha. **((dvr talking to the person at the other end of the phone))**
LRP: Ya::h, I'm [just] eating.
DVR: [.hhh]
(2.0)
LRP:
LRP: (I'm) ea[ting].
RRP: [May I ha]ve something to eat, please?
LRP: I'm just eating. **((dvr looks right, gets a lunch box))**

(2.9)
LRP: (.) No, ↑no. A- (.) At school there was spinning wheel. **((dvr opens lunch box))**
DVR: Some grapes and apricots, Macy?
(1.5)
DVR: Share them with Joel, [please, OK?
LRP: [(At school there was)] a spinning wheel.
(2.9)
LRP: Yeah.
(2.4)
LRP: It was upstairs.
(1.1)
LRP: No::. (.) ( ) do what?
(1.2)
LRP: °Yeah°.
(3.5)
LRP: OK.
(2.5)
LRP: I don't ( ). **((dvr quickly glances back))**
(1.1)
LRP: Are you ( ) away.
(2.8) **((dvr quickly glances back))**
LRP: AWAy::.
DVR: Yes, sweetie.
(1.1) **((dvr stretches her arm back to get the handsfree system))**
LRP: Kiss (.) you(h) ↑too::.
(2.5)
RRP: Joel?
DVR: Hiya.
RRP: Wher- (.) uhm. (Would [you like] to share this.)
DVR: [hehehe .hh]
(1.0)
LRP: I do:n't.
(1.0)
DVR: °hehe° .hh
RRP: Joel doesn't want it.
(4.5)
LRP: (No-) (.) ( )
(1.6)
DVR: You are in a taxi now.
(0.9)
DVR: You are.
(0.9)
DVR: OK.
(6.3)
DVR: Were you meeting him?
(2.0)
DVR: OK. (.) .hh (.) Good luck. hh
(1.5)
DVR: I said good luck.
(3.8) **((the phone call is cut off))**
DVR: Can I have my phone back please you guys. **((quick glance back and reaches her arm to the back))**
RRP: Yeah.
(13.8) **((withdraws arm, shifts gear, applies indicator with RH, reaches left arm back again, gets the mobile phone, looks at it))**
RRP: Justi:ne?

```
119  DVR: Wait a minute, I just have to phone mummy back quickly.
120       (3.3)
121  RRP: ((A long sigh))
122       (3.1) ((adjusts handsfree system))
123  DVR: Sorry, (I got that little bit, through (       ) bad
124       reception.
(TAPE ENDS)
```

Distracting elements

- feeding the children while driving
- reaching for food and packets
- eating while driving
- talking to children in the backseat
- organising the children's activities
- talking on the phone, organizing children's talk on the phone, talking on the phone as a "secondary" participant
- initiating a call
- sharing, reaching for and handling a mobile phone and mobile phone device (handsfree system)

Impact on driving activities

- driver engages in a distracting activity, with several overlapping and simultaneous distracting elements, for several minutes
- driver holds mobile phone in hand while holding wheel
- driver takes hand off wheel to eat, to open lunch boxes, to reach for mobile phone, to reach for and handle a handsfree device
- driver looks away from road to handle lunch box, to look at the backseat, to look at the mobile phone device

Discussion

In this example, the driver is engaged in free and partly slow intra-city driving in a suburban area. The driver has picked up two children from school and starts off from a school area. There are many pedestrians and there is quite a lot of traffic. In this example the driver engages in such distracting elements as eating, feeding, talking to children in the backseat, handling a mobile phone, handling a handsfree system, talking on the phone and making a phone call. It shows that sometimes:

- in cars even three or more activities (some distracting the driving) are happening simultaneously,
- one distracting activity gives rise to another and
- these activities can be coordinated with one another.

The example shows how drivers often face situations in which they have to manage several distractions simultaneously while driving. A good example of such simultaneity of distractions can be seen when the driver, at the same time, turns at an intersection, handles the handsfree system, talks on the phone and tries to reach for the phone device from the backseat (between 3:08–3:25 and lines 84–117). Despite the fact that sometimes distractions occur simultaneously, the example also shows that many of the driving distractions are *coordinated with the driving activity* so that for example reaching for and handing over objects is done while driving slowly, slowing down or while being at a stop (e.g. handing over lunch to a child passenger in the backseat *after* coming to a stop (2:22 and line 58); asking the child to wait while initiating a phone call and driving (4:03 and lines 118–119). In addition, many distractions are produced after one another, as a series of activities, and not simultaneously. For example, if there is a looming possibility that a driver should engage in

several distracting activities simultaneously she can be seen to organise them so that one is halted and then performed after the other distraction has come to an end. The driver also checks the children's actions in the backseat several times, but does this in seemingly appropriate moments with regard to other traffic and the driving activity. In the following, we discuss in more detail three distractions, their context and how they emerge and are solved during the driving. These are 1) eating and feeding, 2) the use of and talking on a mobile phone and 3) conversation with children in the backseat.

Eating and feeding

In the example, the driver is seen to hand over food to the children in the backseat and also to eat herself. The driver organises the eating and feeding with stops in the following ways:

1. Driver prepares to give something to eat to LRP only after she starts to slow down and has almost come to a stop (traffic is stopped ahead) (0.35). She hands over the food to passengers while being at a stop (0:44).
2. Driver begins to take a sandwich only after she begins to slow down (traffic is stopped ahead) (0:53); she opens the package while being at a stop; drives slowly while eating (traffic is slow).
3. RRP requests the driver for something to eat (2:19 and line 57); the driver begins to check for the lunch box, picks it up and opens it and hands it over to the backseat only after she has come to a stop at an intersection (waiting for traffic to move) (2:22–2:32).

In this example, the driving situation is complicated and demanding at those moments when the driver hands over food to the children in the backseat and also eats herself. Consequently, the driving situation provides an opportunity (the traffic is slow and there are many stops) for organizing the eating and feeding activities. Therefore, the example shows that in particular driving situations distracting activities can be temporally adjusted and thereby to be organised successfully with the driving activity.

Driver handling the mobile phone / the handsfree system and talking on the phone

In the example, the children have been talking on the phone to their mother. The driver owns the phone. There is a handsfree device attached to the phone. After the children have stopped talking to their mother, the driver reaches for, first, the handsfree device and then later the phone from the backseat. During the segment, she extends her hand to the backseat three times. The use of the mobile device overlaps with the approaching of and a turn at three intersections. Consequently, the use of the phone overlaps with the necessary driving actions at intersections (using the indicator, shifting gears, turning the wheel, monitoring traffic). This poses a challenge for the driver.

1. In the first instance, LRP hands over the handsfree system to the driver (2:58 and 3:09). The dvr extends her left arm in order to reach for the handsfree system (3:03). At the same time the dvr slows down, prepares for a turn at an intersection and uses her right hand to apply the indicator. At this point both of her hands are off the wheel (3:08). After this she places the handsfree in her ear and talks on the phone. During the phone call driver makes a right turn (across traffic).
2. In the second instance, a couple of seconds later, at the intersection, *while making the right-turn* and turning the wheel, the dvr extends her left arm to the back again in order to reach for the mobile phone (3:16). At the same time, she is talking on the phone and therefore does not verbally request the children to hand over the phone (3:19). The children apparently misunderstand what the driver is doing, because they try to hand her the food from the backseat. The road to which the driver has turned is very narrow. There are cars parked on both sides of the road and there is a lot of oncoming traffic (e.g. a bus). The driver is therefore in a difficult spot at an intersection and has to monitor traffic while on the phone. The driver then withdraws her hand (without reaching the phone), shifts gears and continues driving.

3. In the third instance, the phone call is cut off. Dvr reaches back and requests for the phone which is in the backseat (3.48). She is approaching another intersection, applies the indicator with her right hand while trying to get the phone (both hands off the wheel). RRP hands her the phone, she takes it in her left hand and uses both hands to steer the wheel (3:54). After making the left-turn, she alternates looking between traffic and phone (she looks at the phone at 3:56 and 3:58). After this stops at yet another intersection, keeps alternating her looking between traffic and the phone and then dials (4:03). The phone call is answered after which the driver starts picking up speed and makes a right-turn.

Previous driving research has provided accumulating evidence of how a conversation over a mobile phone in cars and a conversation with co-present passengers can distract the driver. The above analysis provides new qualitative findings that supplement prior research in that it shows how complex and interconnected these activities are.

First, it is worth noting that talking on the phone is not the only form of distraction connected to the use of mobile phones. Drivers also often physically handle and look at the phones, which can distract them from driving. In addition to this, although handsfree devices are generally thought to absolve drivers from physically looking at and handling phones, the above example shows that this is not necessarily the case. Drivers can also share their phones and handsfree devices with their passengers (cf. Weilenmann and Larsson 2001), which then forces them to physically handle and distribute the devices. In the above example, it is also noteworthy that the driver's handling of (and and talking on) the phone is simultaneous with driving and turning at intersections. For example, when she takes the handsfree system from the child (lines 84–85), she is at the same time preparing for a right-turn across the traffic. The driver applies the indicator at the same as she is fiddling with the handsfree system. In this situation, the handsfree system does not prevent her from being distracted or from being forced to take one hand off the wheel. Slightly later, she is also trying to get her hands to the mobile phone device (which is still in the backseat) and she does this while she is making a turn at an intersection. At these moments, she does not have both of the hands on the wheel and she makes quick glances at the mobile phone.

Second, the example shows that the impact of the presence and the use of a mobile phone in a car is much more complex and versatile than research generally suggests. On the one hand, the phone conversation between the child and her mother involves the driver when the conversation ends. In other words, the ending of the conversation between the child and her mother is not under the control of the driver. When that conversation ends the child asks the driver to take the handsfree system and thereby explicitly involves the driver in the phoning activity. What is also important to note is that the person at the other end of the phone (i.e. the mother) cannot know that as the conversation is ended the driver is just then taking a difficult right-turn. On the other hand, the example also provides evidence to suggest that organizing talking on the phone can be more challenging than talking with a passenger. The likely reason for this is that talking on the phone is a dialogic activity in which the person at the other end of a phone is not sensitive to the demands of the driving (as co-present participants may be). In the above example, the driver maintains the phone call conversation while taking turns at intersections and while monitoring other traffic. In other words, the driver does not request the person at the other end of the phone to wait (e.g. "Wait, I'm at an intersection"), she later does not back down from making the phone call, or end the phone call when driving demands increase. This suggests that the driver is under social pressure to maintain the flow of interaction despite the simultaneous demanding driving activities. It is important to compare the organization of a phone call conversation with for example the following interactional phenomena that occur as part of the interaction *inside the car*:

- the driver *delays* her response to a child's request in view of the simultaneous driving action (2:22, line 57; she gives food to the child *after* coming to a stop)
- the driver *does not respond* to the child's request (line 80)

- the driver *does not respond* to the child (lines 96)
- the driver requests the child to *wait* while she is making the phone call (4:05, line 119)

In these situations in which the driver is talking to passengers *inside the car* the demands of driving visibly impact and override the conversational or other actions inside the car. This does not happen with mobile phone conversation. In addition, the driver's mobile phone conversation visibly abstains her from talking to the children when she extends her arm to the backseat to get the phone. She is not able to verbally request the object because she is on the phone.

Third, children in cars pose a special kind of demand to drivers. The most important reason for this is perhaps that whereas adult passengers can be sensitive to the demands of driving and coordinate their actions with it, children regularly are not. We can see this several times in the above example in situations in which:

- a child requests for food while the car is approaching an intersection (line 57, 2:20)
- a child is handing over the handsfree system to the driver while the car is approaching an intersection (lines 80–82, 3:04)
- a child demands the driver's attention while the driver is at an intersection making a right-turn and looking at and dialling the phone (line 119, 4:04).

In addition to the fact that children demand the attention of the driver, the driver's actions also show that she is monitoring the children while driving. As the example shows, the driver frequently orients to the children's actions and responds to them. For example, the driver visibly listens to (and even participates in) the children's phone calls (see lines 29 (1:19), line 41 (1:59), line 45–46 (2:04) and line 50 (2:12)).

Finally, the above example shows how one distraction provides an opportunity for another to occur. This can be seen for example when RRP ends her phone conversation and then requests the driver for food. In addition, the LRP ends his phone conversation, he requests the driver to take the handsfree system, which in turn occasions the driver's phone conversation with the children's mother. Also the fact that the phone call is cut off occasions the driver's redialling.

Summary

In sum, the above analysis provides examples of different kinds of distracting activities and how they impact and are organised with driving. First, the driver eats and feeds the children in the backseat while she is driving. She visibly organises the eating and feeding activity with the demands of driving, for example by handing over food to the backseat while being stopped at a junction. Second, the example shows how the handling of and talking on mobile phones impacts driving. It shows that it is harder to temporally adjust mobile phone conversation than an in-car conversation, largely because a non-present caller / called cannot make observations of the driving situation. This becomes evident in the ways in which drivers do not ask persons on the phone to wait in the same way to ask co-present passengers to wait. Drivers also do not delay their responses to people on the phone in the same they delay responses to co-present passengers. Third, the example shows that a handsfree device can be shared between in-car participants in which case it requires physical handling. A handsfree device also does not free the driver from looking at the phone. Fourth, the analysis shows that interaction with children poses its own interactional demands in a driving situation. On the one hand, children require on-going attention in that they frequently make requests and ask questions which socially require a response. On the other hand, drivers also tend to monitor, observe and participate in the children's actions in the backseat. Fifth, many of the distractions in the above example are linked, one providing an opportunity or even making relevant another (the child stopping the phone conversation leads to her request for food).

3.2.2.6 Example 13: Driver requests passenger to answer mobile phone

Data from: "Habitable cars" by Eric Laurier

Folder: Ruth_Roisin

File: answering phone.mov

Duration: 1:23

Driving situation

Fast intercity driving on a two-lane road with relatively heavy traffic. Evening.

Occupant information

Female driver, female passenger in front seat.

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
0:02	Dvr	Phone on dvr's lap, takes the phone in her hand (phone ringing), left hand on wheel	Free inter-city driving
0:04	Dvr	Looks down at phone (1.5 seconds), left hand on wheel	Free inter-city driving
0:05	Dvr	Glances at traffic, looks back at phone (less than a second), left hand on wheel	Free inter-city driving
0:06	Dvr	Glances at traffic, looks back at phone (1.5 second), left hand on wheel	Free inter-city driving
0:07	Dvr	Begins to hand over the phone to passenger, left hand on wheel	Free inter-city driving
0:08	FP	Takes the phone	Free inter-city driving
0:08	Dvr	Looks at the phone (1 second), left hand on wheel	Free inter-city driving
0:09	Dvr	Looks at entertainment system (less than a second), right hand to wheel	Free inter-city driving
0:09	Dvr	Adjust volume with left hand (about 2 seconds), right hand on wheel	Free inter-city driving
0:10	Dvr	Looks at speedometer (or something) behind wheel and then turns head directly to phone and passenger (2 seconds altogether)	Free inter-city driving
0:12	Dvr	Quick glance at traffic and then turns head to passenger and phone (1 second) , both hands on wheel	Free inter-city driving
0:13	FP	Answers the phone	Free inter-city driving
0:19	Dvr	Looks in rvm	Free inter-city driving
0:22	Dvr	Makes a comment to the caller, continues talk	Free inter-city driving

Time	Occupant	Action	Driving activity
0:27	Dvr	Turns head to passenger (1 second)	Free inter-city driving
0:31	Dvr	Shifts gear, red lights ahead	Starts to slow down
0:33	Dvr	Requests to talk on the phone, left hand on gear stick, right hand reaches for the phone, both hands off the wheel (1.5 seconds)	Slowing down
0:36	FP	Begins to give the phone	Slowing down
0:36	Dvr	Takes the phone with right hand, left hand also off the wheel (1 second)	Slowing down
0:37	Dvr	Places the phone on ear.	Slowing down
0:38	Dvr	Moves left hand on gear stick. Both hands off the wheel.	Slowing down
0:43		Car stops at traffic lights, driver talking on the phone (14 seconds)	Stopped
0:57	Dvr	Shifts gears (traffic lights turning green)	Stopped
1:01	Dvr	Talking on the phone	Starts moving, slow
1:02	Dvr	Shifts gears, both hands off the wheel (2 seconds), looks in the rvm, talking on the phone	Slow, stuck behind cars turning right
1:04	Dvr	Begins to make a gesture (“back”), then moves hand straight to gear stick, both hands off the wheel (3 seconds), talking on the phone	Moving slowly, stopped
1:07	Dvr	Looks into rvm, checking traffic from left behind, talking on the phone	Stopped
1:08	Dvr	Begins to shift lanes (to left), turns wheel with one hand, talking on the phone	Starts moving / shifting lanes
1:10	Dvr	Applies indicator, ending phone call, turns wheel with one hand	Moving slowly, between lanes
1:11	Dvr	Ends phone call, removes phone from ear	Moving slowly, between lanes
1:11	Dvr	Places phone on lap	Picking up speed, between lanes
1:12	Dvr	Both hands on wheel	Picking up speed
1:14	Dvr	Left hand on gear stick, moves head to right, checks traffic on right lane, talking with passenger	Picking up speed
1:15	Dvr	Adjusts volume in entertainment system (5 seconds), talking with passenger	Picking up speed
1:16	Dvr	Looks at entertainment system (very brief glance), talking with passenger	Free driving
1:17	Dvr	Glances in rvm, talking with passenger	Free driving
1:20	Dvr	Glances in rvm, begins to shift lanes, no indicator, talking with passenger	Slowing down

Transcription

```
1         ((radio on))
2   FP:   tch. There must have been an accident, I think.
3   DVR:  (must be an acci-) Is that my phone on, (0.7) Oh. (1.6)
4         Oh that's Belfast, can you answer that.
5   FP:   °mm°,
6         (.)
7   DVR:  hit the green button.
8   FP:   oh. .hh Hello=? (1.8) O:h, it's Beth here, i- I'm
9         answering
10        Catherine's phone, she's ehm,
11        she's (.) eh driving at the moment.
12        (1.6)
13  DVR:  >Who's that. Is that [Mige]lla Kay?<
14  FP:                        [who's-]
15        Who's there hh (.)
16        [Mi]  [ge-] -
17  DVR:  [.hh] [##] I already hear you nutbag.
18  FP:   Is it Migella.
19        (.)
20  DVR:  hihi heh heh
21  FP:   is::
22        (1.2)
23        what time we will b- well, [I think] we'll .hh
24  DVR:                             [Oh],
25  DVR:  >wait a sec. I'll speak to her now, I'm at a red light.<
26  FP:   Okay.
27        (1.5)
28  DVR:  .hh Hello there you girl ya, how are you. hh
29        (1.8)
30  DVR:  heh heh he hee .hh How's it going.
31        (1.0)
32  DVR:  .hh Okay::, I've no complaints, you know, we're staying
33        mobile, .hh Are you ju- is that- (.)
34        aye:, we're just coming home from work. We have to come  home-
35        (1.3) aye. (1.5) I'm the big woman
36        now.(0.8) yeah r=ight. (.) Yeah(gh) w(gh)- i- i- oh freaking
37        hell, are you joking me, I can't
38        wait (they can get back) fucking off. .hh but I was gonna say
39        to you, I give you- (1.0) yeah, I
40        give you a wee phone back when I get home. How does that
41        sound. (1.1) Good woman, speak to you
42        the::n. (.) Bye?
43        (3.0)
44  FP:   Migella(h)?
45  DVR:  Mi[gella],
46  FP:     [way]= hh
47        [(     )]
48  DVR:  [Migella works] in the Royal.
49  FP:   Oh cool.
50  DVR:  and I just phoned her, just to find out, you know, what's the
51        sort of jazz at home like.
```

Distracting elements

- phone call, passenger answers the phone, driver takes the phone, talks on the phone, ends the phone call
- handing over the phone, handling the phone
- driver talking to the person at the other end of the phone even though not handling the phone ("non-ratified" participant in the phone call)
- driver talking on the phone while changing lanes at a busy intersection
- managing the entertainment system, adjusting volume

Impacts on driving activities

- one hand off the wheel and sometimes both hands off the wheel
- gaze turned away from traffic

Discussion

The following analysis adds to current driving research that has studied how mobile phone conversations impact the driving activity. It will focus specifically on the interactional and social impact of the ringing of a phone and on how a mobile phone conversation influences the driver's actions.

In the example, the driver and the passenger (both female) are driving in a built-up city area. They are driving on a two-lane road and on the faster lane (right lane). It is an evening and there is quite a lot of traffic. The driver has placed the mobile phone on her lap. This provides further evidence that drivers can prepare for potential distractions by placing objects in the car so that they can be found and reached easily. The phone rings (0:02). The driver looks at the phone's display several times (0:04–0:07). The driver's actions suggest that she is not able to identify the caller, although the information on the display shows where the call is coming from (number and area code). The driver then asks the passenger to answer the phone (line 4, 0:07).The passenger then takes the phone and looks at the phone's display (0:08). After this the driver adjusts the volume in the entertainment system (0:09), orients briefly to driving (0:10–0:12) and looks at the passenger again. The driver then instructs the passenger on how to answer the phone (line 7) after which the passenger answers the phone (0:13, line 8).

The example so far shows that *having a conversation on a phone* is not the only distractive feature related to the use of mobile phones in cars. It shows that *the ringing of a phone* occasions a series of actions *before* the phone call begins and that these actions visibly impact the driver's driving activity. In this example the driver is not using a handsfree device, but even the presence of such a device would not prevent the driver from physically handling the phone and looking at it (cf. Haddington and Rauniomaa, accepted).

The example also shows that drivers can ask for the passengers to help them (e.g. through phone sharing) with tasks that can potentially distract the driving activity. By asking for passenger assistance drivers can ease the burden posed by a driving distraction. In the example, the driver asks the passenger to answer the phone (line 4, 0:07) and at the same time hands the phone to the passenger. While the driver hands over the phone to the passenger, she takes a brief look away from the road to the phone. The driver can also be distracted by giving instructions as to how the phone is used ("hit the green button", line 7).

Interestingly, the example also shows that drivers can participate in the phone call even though they are not the primary participants in it (see also example 12). In the example, the driver visibly listens

to the phone call. She tries to guess the caller's identity (line 13) and also participates in the phone call by making a remark directly to the caller (line 16). She also clearly displays that she is listening to the phone conversation (cf. The driver's "Oh" on line 24). This shows that even though drivers do not physically use the phone they can still participate in the phone call, especially if someone is answering and talking on their own phone on their behalf.

The example also shows that drivers can orient to and anticipate changing driving scenarios as providing a window of opportunity to engage in a distracting activity. In the example, the driver uses the red lights and the subsequent projected stop at the intersection as an excuse to take the phone and talk on it (0:33, lines 24–25). She asks the passenger to stop the conversation ("wait a sec" in line 25) and begins arrangements for getting the phone back ("I'll speak to her now, I'm at a red light" in line 25). The passenger gives the phone to the driver while the car is slowing down and before it has come to a stop. In other words, the driver starts the distracting activity *after* she begins to slow down and prepare for the stop at an intersection. The driver begins to talk on the phone *before* the car has come to a full stop.

Even though drivers can seek for appropriate opportunities to talk on a phone when it least distracts the driving activity, the example shows (similarly with examples 5 and 7) that a mobile phone conversation still provides a temporal challenge to the driver. In other words, in contrast to conversation inside the car, the driver does not withhold, postpone or terminate the phone conversation in order to avoid using and talking on the phone while engaging in demanding driving actions (cf. Horrey and Lesch 2009). Rather, the driver begins to end the phone call (line 38) only *after* the lights have turned green and traffic has started moving. Such an overlap between the phone conversation and a driving activity is caused by the fact that a phone call cannot be ended in the same way as many other in-car distracting activities. The ending of the phone call has to be done together with the person at the other end of the phone (Schegloff and Sacks 1973). In the example, the driver is also still ending the phone call conversation while she shifts lanes. As part of the lane shift she looks in the rear view and side mirrors, shifts gears and uses the indicator. While she is shifting gears in order to change lanes, she is forced to take her only hand off the wheel.

Consequently, although the driver clearly orients to the phone call's potential as a distraction and tries to coordinate the phone call with a suitable less-demanding moment in driving (i.e. start the phone call when coming to a stop and ending it when traffic starts to move), her actions show that it is still hard to coordinate the demands of the driving together with the *social* demands of the phone call. In spite of succeeding in the coordination of the driving and the phone call at the beginning of the call, the end of the phone call overlaps with some demanding driving actions: stopping and starting off at an intersection and lane changing, and related actions such as looking in the rear view or side mirrors and shifting gears.

Finally, the example also shows how passengers can orient to in-car conversation as a potential distraction and coordinate their talk with a concurrent driving activity. In the above example, the phone call leads to another potential distraction: driver conversing with a passenger. The passenger has basically been excluded from the phone call and has been treated as an outsider (her actions show that she does not know the caller). In social interaction, such situations can be treated as requiring an explanation. Indeed, the passenger produces a turn that guesses the identity of the caller (line 44). However, it is noteworthy that the passenger *waits* until the car has straightened up after the lane shift before she voices her guess. By producing her guess after the driver has finished the lane shift she shows that she is sensitive to the demands of the current driving activity and that the start of a new activity could potentially distract the driver. This is markedly different from the ways in which children can be seen to time their behaviour in cars (cf. example 12) and the ways in which mobile phone callers can participate in the driving activity.

Summary

The analysis shows that in addition to mobile phone conversations, the ringing of a(ny) phone is can be a significant driving distraction. First, in the above example, the ringing phone visibly influences the driver's actions by occasioning such actions as handling the phone and looking at the mobile phone's visual display before the actual phone call. Second, the above example shows that although the passenger answer the phone, the driver listens to the phone call conversation and actively participates and becomes involved in it. Third, the analysis also shows that although the driver clearly is sensitive to the mobile phone conversation as a distraction to driving (i.e. she requests the passenger to answer the phone), she actively finds an appropriate moment to engage in the mobile phone conversations. Although the driver finds such an opportunity when she stops at a red light, it is still hard for drivers to coordinate the conversation with the driving activity. This is especially true with incoming calls, because incoming calls cannot be anticipated and planned. Moreover, although an apt moment for starting a phone call is easy, it is very difficult to adjust the end of the phone call with driving. The above example shows this when the driver attempts to end the call, but traffic starts moving and she has to engage in a difficult lane change. Fourth, the above example further shows that one distraction can lead to another (a mobile phone call makes relevant the reducing of the volume in the entertainment system), and fifth, that (adult) passengers regulate their actions and talk with respect to the driving situation.

3.2.2.7 Example 14: Driver helps children in rear seat

Data from: "Habitable cars" by Eric Laurier

File: pedestrians.mov

Duration: 1:34

Driving situation

Built-up environment, intra-city driving. Relatively busy traffic and jaywalking pedestrians.

Occupant information

Female driver, a child sleeping in the backseat.

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
0:11	Dvr	Stops at a red light	Stopped
0:12	Dvr	Turns head left and looks back at child in backseat	Stopped
0:13	Dvr	Places seatbelt under right armpit	Stopped
0:14	Dvr	Looks down, removes handsfree that is tangled in the seatbelt, puts handsfree on passenger seat	Stopped
0:16	Dvr	Looks up at traffic lights, is getting ready to move upper body and turn 150 degrees left to attend to the child, when yellow lights start blinking, before, turning to green	Stopped
0:17	Dvr	Cancels body movement	Stopped

Time	Occupant	Action	Driving activity
0:18	Dvr	Looks forwards	Starts picking up speed
0:18	Dvr	Looks left, jaywalking pedestrian	Stops
0:19	Dvr	Let's pedestrian cross the street.	Stopped
0:21	Dvr	Starts driving	Starts moving
0:22	Dvr	Looking forwards and driving	Picks up speed
0:28	Dvr	Looking forwards and driving	Starts slowing down
0:34	Dvr	Gets ready to attend to the child in the backseat. Turns upper body 150 degrees and reaches for the child (probably to adjust seatbelt or head) (16 seconds)	Stopped
0:41	Dvr	Attending the child, glances at traffic ahead	Stopped
0:47	Dvr	Car in front starts moving. Dvr still attending to the child.	Stopped
0:49	Dvr	Returns to seat, looks at traffic	Stopped
0:51	Dvr	Starts driving	Starts picking up speed
0:51	Dvr	Turns head left to look at the child	Picking up speed
0:56	Dvr	Puts seatbelt back in right place, both hands off the wheel (2 seconds)	Picking up speed
1:02		Jaywalking pedestrians	Slows down
1:05	Dvr	Shifts lanes	Picking up speed and then slowing down
1:17	Dvr	Places seatbelt under right armpit	Stopped
1:18	Dvr	Turns upper body left 150 degrees to attend to child (7 seconds)	Stopped
1:25	Dvr	Turns back, looks at traffic	Stopped
1:28	Dvr	Puts seatbelt back in right place	Stopped
1:29	Dvr	Turns head at child (1 second)	Stopped

Transcription

```
1                   ((children's music throughout the segment))
2                   (17.8)
3       DVR:        Tch. (1.6) Go. ((to jaywalking pedestrian))
4                   (18.6)
5       DVR:        Oopsy daisy. (1.6) Hi::. ((to child))
6                   (7.5)
7       DVR:        Uh(hh).
8                   (28.0)
9       DVR:        ((sniff))
10                  (8.3)
11      DVR:        hhhh
```

Distracting elements

- a sleeping child in the backseat (dvr adjusting child's seatbelt or straightening head)
- handling a handsfree system

Impacts on driving activities

- driver moves the seatbelt under her armpit to better reach the child in the back
- driver disattends to traffic during the distracting activity
- driver attends to a distracting activity when the traffic starts to move

Discussion

In this example the driver is engaged in intra-city driving with relatively heavy traffic and a few jaywalking pedestrians. There is a child sleeping in the backseat behind the front passenger seat. It is possible (we cannot see it in the camera) that the child's head is dangling or the child is sleeping in a bad position or the child's seatbelt needs adjusting. Whatever the problem is, during this 90-second segment the driver orients to the child three times and tries to correct it. The potential distracting elements in this example are the sleeping child in the backseat who needs attention and the handsfree system which she removes from her shirt before she can attend to the child.

The data shows (0:12–0:14) that after the driver has stopped at traffic lights she begins to attend to the child by removing her handsfree system that is attached to her shirt and by placing her seatbelt under her right arm. During these actions she mostly looks away from the traffic ahead and takes two quick glances at the traffic lights in between. The driver's actions show that she attempts to coordinate her non-driving actions with the traffic flow and the traffic lights. However, at this point when she begins to orient to the child, the traffic lights change from red to flashing yellow (in this country, indicating that the driver may proceed with care if the road is clear, but has to give way to pedestrians and other vehicles that may have priority). The changing driving situation occasions her withdrawal from the non-driving actions. She visibly expresses her slight frustration at this ("tch", line 3). The driver starts to drive, but immediately after this a pedestrian emerges from her left and the driver lets the pedestrian cross the street. The driver communicates this by producing a small head shake to the right and by saying "go" (line 3). The driver continues to keep the safety belt under her arm. This displays her preparedness for and intention to resume a distracting activity as soon as a window of opportunity for doing that emerges (the traffic flow stops or until the next red light). The driver's actions show how she coordinates her driving activity and distracting non-driving activities.

The second time she orients to the child (0:34) the traffic has stopped. However, the car is neither at an intersection nor at red lights. After coming to a stop, the driver rises from her seat and turns her body extensively to the left in order to reach the child. While she attends and talks to the child (line 5) she once glances at the traffic ahead. This distracting activity lasts approximately 17 seconds altogether. The traffic in front of the driver starts moving after about 12 seconds. After finishing the distracting activity, she sits back to the seat and starts driving and replaces her seat belt. Shortly after this (1:11) the car arrives at an intersection with traffic lights. Here the driver again places her seatbelt under her arm and (for the third time) shifts her body and attends to the sleeping child. This time she sits back to the seat before the lights turn to green.

The driver's distracting actions have an impact on the driving. This becomes visible at the second time she attends to the child. The traffic starts to move before the driver resumes driving. Consequently, even though the driver clearly attempts to coordinate her distracting actions with the demands of driving by visibly seeking for a time and the place in the traffic flow in which she can attend to the sleeping child (at red lights, when the traffic comes to stop), her distracting actions sometimes overlap with moments that require attention to driving (cf. the analysis in examples 10 and 11). The example therefore shows that even though the driver attempts to coordinate the distracting actions with the driving, some overlapping occurs at the end of the distracting activity.

Summary

The example shows how helping children in the backseat can be potential driving distractions. In the example, helping a sleeping child involves the driver's extended looking away from traffic. The example also shows how the driver attempts to coordinate the distracting activity with appropriate moments in the driving. Finding an appropriate moment to start a distracting activity is relatively easy, but as the example shows, the temporal adjustment of the end of a distracting activity with the demands of driving and surrounding traffic is difficult. Finally, the example shows how a handsfree system is a physical obstacle that needs to be removed when the driver attends to the child in the backseat.

3.2.2.8 Example 15: Driver making a phone call, interacting with a child, and writing

Data from "Habitable cars" by Eric Laurier

File: address.mov

Duration: 2 minutes 25 seconds

Driving situation:

Urban city driving with other (sometimes intersecting) traffic.

Occupant information

Female driver, experienced, four children in the car, one in the front seat (driver's daughter) and three in the backseat. Driver has a handsfree device in her ear. The driver is holding a mobile phone in her right hand or keeping it on her lap throughout the example.

NOTE: Times indicate the point in the recording, NOT the time of day

Time	Occupant	Action	Driving activity
0:00	Dvr	Using a mobile, dialling or searching for a name, looks down at the phone (1 second), one hand on the wheel (alternating quick glances between traffic and phone)	Urban, built-up environment, free driving
0:01	Dvr	Looks down at the mobile phone (1 second), pressing buttons, one hand on the wheel	Urban, built-up environment, free driving
0:02	Dvr	Looks down at the mobile phone (2 seconds), pressing buttons, one hand on the wheel	Urban, built-up environment, free driving
0:04	Dvr	Looks down at the mobile phone (1 second), pressing buttons, one hand on the wheel	Urban, built-up environment, free driving
0:05	Dvr	Looks down at the mobile phone (1 second), using it, one hand on the wheel	Urban, built-up environment, free driving
0:09	Dvr	Glance to rvm	Urban, built-up environment, free driving
0:12–0:24	Passengers	Children chattering	Urban, built-up environment, free driving
0:24	Dvr	Looks down to the entertainment system (1 second); turns down the volume (1 second)	Urban, built-up environment, free driving
0:27	Dvr	Phone call begins, dvr holds hand to handsfree's ear piece and presses it in her ear, probably due background noise.	Urban, built-up environment, free driving
0:32	Dvr	Drv lowers hand from ear piece; keeps hand on her lap. Talking on the phone and trying to remember a person's name.	Urban, built-up environment, free driving

Time	Occupant	Action	Driving activity
0:48	FP	Child opening the cover of an arm rest compartment, potentially a distracting activity	Urban, built-up environment, free driving
0:59	Dvr	Phone call continues; dvr starts searching for something in the armrest compartment; looks away from traffic for 3 seconds.	Stopped
1:02	Dvr	Opens the glove compartment, traffic starts to move, car starts moving, dvr is not looking at traffic (2 seconds), child FP turns to talk to a rear passenger	Moving slowly in traffic, urban environment
1:04	Dvr	Closes the glove compartment	Moving slowly in traffic, urban environment, approaching a T-intersection
1:07	Dvr	Looks down to the left (door storage) (1 second)	Moving slowly in traffic, urban environment, approaching a T-intersection
1:10	Dvr	Looks down to the phone, phone in her hand (2 seconds), makes an attempt to end the phone call	Moving slowly in traffic, urban environment, approaching a T-intersection
1:13	Dvr	But phone call continues, looks to the left (1 second), opens the glove compartment	Moving slowly in traffic, urban environment, approaching a T-intersection
1:14	Dvr	Involved in the phone call, looks in the glove compartment, looks to the floor (5 seconds)	Slowing down and stops
1:19	Dvr	Involved in the phone call, picks up a notebook, puts it on the child's lap, talks to the child on the front seat and asks her to write down the address (2 seconds)	Stopped
1:21	Dvr	Involved in the phone call, looks in the armrest compartment (1 second) – (altogether, has not checked traffic for 8 seconds)	Stopped
1:22	Dvr	Involved in the phone call, looks up, closes armrest compartment	Starts moving with traffic, approaching a T-intersection
1:25	Dvr	Involved in the phone call, applies the indicator (right turn across traffic)	Moving slowly, approaching a T-intersection
1:26	Dvr	Involved in the phone call, looks to her left to the glove compartment (1 second)	Moving slowly, approaching a T-intersection
1:27	Dvr	Involved in the phone call, opening the glove compartment	Moving slowly, approaching a T-intersection
1:28	Dvr	Looks right at traffic (less than second); is opening the glove compartment; arrives at an intersection	Moving slowly, arrives at a T-intersection
1:29	Dvr	Looks into the glove compartment (3 seconds)	Stopped
1:32	Dvr	Looks right at traffic, monitoring traffic	Stopped

Time	Occupant	Action	Driving activity
1:34	Fp	Passenger finds a pen in the glove compartment	Stopped
1:35	Dvr	Looks left at the pen, dvr again makes an attempt to end the phone call, looks at the phone at the same time	Stopped
1:36	Dvr	Looks at phone, phone still in her hand, resumes phone call	Stopped
1:37	Dvr	Looking at traffic, puts the phone on her lap, both hands now on the wheel, talking on the phone	Stopped
1:43	Dvr	Talking on the phone, looking at traffic, child in the backseat shouts	Starts moving, right-turn across traffic
1:45	Dvr	Instructs child to write the address (makes a gesture with left hand), one hand on the wheel	Turning and picking up speed at intersection
1:47	Dvr	On the phone, at the same time instructs child, looks and points at the notebook (1 second), maintains the pointing gesture (5 seconds), one hand on wheel	Picking up speed, urban, built-up environment
1:52	Dvr	Instructs child, a gesture with left hand, one hand on wheel	Picking up speed, urban, built-up environment
1:53	FP	Child talks to driver, driver nods in return	Urban, built-up environment, free driving
1:54	Dvr	Presses the handsfree in her ear (2 seconds), repeating a phone number (5 seconds)	Urban, built-up environment, free driving
1:58	Dvr	Looks left to child writing (less than second)	Free driving through road construction zone
1:59	Dvr	Both hands on wheel	Urban, built-up environment, free driving
2:00	Dvr	Picks up phone and looks down at it (1 second)	Urban, built-up environment, free driving
2:02	Dvr	Phone call ends, puts phone on lap	Urban, built-up environment, free driving
2:02	Dvr	Looks left to the notebook (2 seconds)	Urban, built-up environment, free driving
2:03	Dvr	Stretches arm to take the notebook; maybe to tear the page (1 second); does not, talking to FP.	Urban, built-up environment, free driving
2:05	Dvr	Returns hand to wheel, both hands on the wheel, talking to FP.	Urban, built-up environment, free driving
2:07	Dvr	Looks left to the notebook (1 second), talking to FP.	Urban, built-up environment, free driving
2:08	Dvr	Stretches arm and points at the notebook (7 seconds), Talks to FP, instructs FP on writing (continues for 24 seconds)	Urban, built-up environment, free driving
2:15	Dvr	Moves arm back to steering wheel. Talks to FP.	Urban, built-up environment, free driving

Time	Occupant	Action	Driving activity
2:22	Dvr	Quick glance at rvm. Talks to FP.	Urban, built-up environment, free driving
2:29	Dvr	Self-grooming.	Stopped
2:32	Dvr	Looks right and talks to the child (2 seconds)	Stopped
2:35	Dvr	Looks right to the child writing; picks up the mobile phone and then without looking at traffic looks straight at the phone (2 seconds)	Stopped
2:38	Dvr	Drops phone on lap, now both hands on wheel, talking to the child	Starts moving
2:44	Dvr	Picks up phone and looks at it (1 second)	Driving slowly
2:46	Dvr	Puts phone on lap.	Driving slowly
2:50	Dvr	Looks down at air conditioning system	Stopping
2:52	Dvr	Adjusts the air conditioning system	Stopped
TAPE ENDS			

In the following transcript, children's chatter or singing and the background music coming from the stereo system has been mostly omitted.

Transcription

```
1   FP:  .hhhh ((sings to the CD))
2   DVR: ((handling the mobile phone, probably searching for a phone
3        number))
4   DVR: I don't even know Jacob's- (.) ((looks in rvm)) I don't even know
5        Jacob's surname.
6        (16.5)((children talking and FP singing quietly))
7   DVR: ((on the phone)) Hello, I'm sorry to bother you. It's Joel
8        Gaynor's mum. Uhm, (.) he's got a playdate this morning with John
9        and his cla:ss, and I've predictably left home without (.) the
10       lis(h)t of(h) wh(h)ere they(h) l(h)ive .h.
11       Uhm, .h Jacob, he's got a little sister in in the morning
12       nursery.
13       (4.2)
14  DVR: Hm, hh Is it Jonathan? (1.3)
15       U:hm, (1.6)
16       They're twins, no::w, of course they would be=
17  DVR: =do you know-
18       (.) Yeah. (3.2) Yeah, ((starts opening compartments))
19  FP:  Can I see one of the cards? ((to the children in the back))
20  RRP: Captain Hook. (.)
21  FP:  No. An[y],
22  DVR:       [Mar-] Yeah, I think I know that one. Nine one one
23       Marb- is that in Stand End, isn't it.
22       (.) Marbleton Mall. ((looks right into door storage))
23       (.) (M five), Marbleton Mall Road nine one one ((looks at
24       mobile phone)),
25       brilliant, thanks ever so much, chee:rs:.
26       (.) U:hm, (.) I'm just in the ca:r, ((reaches for glove
27       compartment))
28       if I have [(a pen) to write it down]. ((seeks for a notebook))
29  FP:            [(Courage,  look.)]
```

DVR: Macy, could you write this number down, luv. **((gives a notebook to child passenger))**
FP: Yes.
(.)
FP: Where's a pe[::n].
DVR: ((looks into arm rest compartment))
RRP: [Could you give] it back, plea::se.
DVR: E:h.
(0.8)
DVR: I'm not coming in, (.) unfortunately. E:hm,
FP: Pen? [(I don't know),
DVR: [Hang on, **((reaches for glove compartment))** (we'll just) find- I haven't got my pen of course. **((looks into gc))**
DVR: Nine one one Marbleton Mall Road.
Uhm, I might have to ring you back when I'm not driving, that migh(h)t be b(h)etter, [thank(h) you very much], cheers]
FP: [I ( ) got a pen (with)], I've got (one).
DVR: Oh, have you got >we got we got we got we got one,<
Hang on, go on, you can- she can write it down. .hh
What is it? Four oh eight oh, (0.9)
FP: Oh eight oh.
DVR: Oh eight oh two. Two, Macy.
(.) ((child screams in the back))
FP: so I write oh eight-
DVR: °Just a two°. ((gesture + turns at an intersection))
(1.5)
DVR: [Seve-]
FR: [oh] eight [oh-]
DVR: [just write two]. **((points and looks at notebook))**
just write two Macy.
FP: two,
DVR: seven six two,
(1.5)
FP: shall I write seven six, ((dvr makes a gesture to passenger))
(.)
DVR: three? ((presses handsfree into ear))
?: seven,
DVR: [three five],
?: [six],
DVR: [three five five nine. **((glances at notebook))**
FP: [three,
five,
DVR: thank you very very much, thank you. bye,
FP: fi::ve,
DVR: [can you write –
FP: [one.
DVR: can you write nine one one, (.)
((dvr looks at and reaches for notebook with left arm))
FP: nine, (.)
DVR: nine one one,
yeah, **((looks at notebook))** s-
no, separate line. **((points at notebook))**
(.) nine [one one],
FP: [nine], one, one.
DVR: Marbleton Ma:ll, (.) m a r, **((withdraws hand))**
FP: m, (.) a, (.) r. (.)
DVR: b l e, (.)
FP: b, (.) l e.
FVR: t, (.) o n. (.)

```
90  FP:  t, o, n.
91  DVR: h, n- new word, m a l l. (.)
92  FP:  m, (1.3) a, (.) l l. (.)
93  DVR: then r d. Uh, road. (.)
94  FP:  r, (1.0) [d].
95  DVR:          [phew], let's see if she's expecting us.
96       (4.2)
97       that's enough, (thank you).
```

Distracting elements

- driver pressing buttons of the phone; driver handling the phone ear piece, pressing it to her ear.
- driver talking on the phone
- driver talking to the front passenger (child) and trying to help the child to write down an address
- driver initiating two phone calls
- reaching for the glove compartments, searching for, reaching for and handling objects (paper, pens, etc.)
- using the entertainment system
- using the air conditioning system
- music in the background
- children talking and screaming (sometimes loudly) in the backseat

Impact on driving activities

- driver engages in a complex distracting activity (several minutes), with several overlapping and simultaneous distracting elements; for example, she drives, talks on the phone and instructs passenger to write the address *simultaneously*
- driver both takes her gaze off the road and her hands off the wheel several times in order handle the mobile phone, the handsfree system, to search and reach for objects and to instruct passenger to write down an address

Discussion

There are five persons in the car: a female driver and four children. Three of the children are seated in the backseat, one in the front seat. They are driving in an urban city with a lot of morning traffic. The driving is mostly free driving, but the car drives through a construction area and through several intersections. The children are chattering in the background, sometimes quite loudly. The child in the front seat is participating in the chatter. In this example, the driver becomes involved in the following distracting activities:

- pressing buttons on a mobile phone
- looking at a mobile phone
- talking on a mobile phone
- handling handsfree equipment
- talking to a front seat passenger
- searching for and handling objects (e.g. from glove compartments)
- instructing a child in writing an address
- using entertainment system and air conditioning system

The driver is on the way to a particular destination (her children's playdate), but she has forgotten an address list at home and cannot remember the address of their next destination. This occasions a need to make a phone call in order to get the address for their destination. She probably calls a kindergarten or similar to ask for the address and a phone number. The driver displays her

frustration of the fact that she does not know the family name of the person that they are to pick up (see lines 4–5), which in turn complicates the phone call because before being able to ask the address she has to figure *whose* address she is asking for. In other words, the driver is facing and voicing an epistemic / memory problem.

What is very important to note here is that this apparently cognitive problem and the subsequent use of the mobile phone are inextricably connected to this particular time, this particular place and their reason for the drive. One does not exist without the other and for the driver they cannot be separated from each other or postponed: without remembering or obtaining the address somehow, they cannot drive on. The handling of the phone and the phone call itself are thus occasioned in the driving situation and in practice necessary for the driving (cf. Haddington and Rauniomaa, accepted). But at the same time these multiple and simultaneous non-driving activities also distract the driver from the driving activity. It is also noteworthy that the driver does not stop to do the phone call. Possible reasons are that they are in a hurry or because the traffic does not provide a possibility to stop.

As we have seen in many other examples in this study, a mobile phone is not only used for having a conversation. The above example provides further evidence for this. First of all, at several points the driver is *not* talking on the phone but is searching for information in it. This activity visibly impacts her driving in that she keeps alternating her gaze between the road (and traffic) and the mobile phone. The mobile phone also visibly requires her attention when she presses the phone's buttons in order to search for contact information. It is possible that such handling of the phone is equally distracting as texting. Second, the above example also supports findings in previous examples that even though distracting activities can be temporally adjusted with the driving so that such activities are started when driving demands less attention, ending some distractive activities (e.g. a phone call) often pose a greater problem for drivers. So, on the one hand, we can see that for example the search and handling of (some) objects, the use of in-car equipment (such as the air condition system and the entertainment system) are activities that *can* be done when the car is coming to a stop (at an intersection, at traffic lights, etc.) and they can be stopped when driving demands it. In the above example, the driver for example searches for a pen and paper in the glove compartment, handles these objects and uses the air condition system while she is at a stop or moving very slowly. But, on the other hand, as regards the phone call specifically, we can see that the driver tries to end the phone call twice but fails to do so. On the first occasion, it is the person at the other end of the phone that continues the phone call, most likely because s/he does not have access to the driving situation. On the second occasion, the fact that the front seat passenger finds a pen triggers the continuation of the call (the driver resumes the call). The latter occasion also shows again how one distraction can lead to and make relevant another one. As this and some of the other examples in this report suggest, drivers do quite often halt such distracting activities as talking to children, handing over or reaching for objects and using in-car technology when driving demands it. However, it is much harder to adjust a phone call temporally (e.g. by ending it) with driving and with what happens in traffic. Third, it is also noteworthy that although the driver has a handsfree system which frees her hand during the phone conversation, the handsfree system does not release her from many other actions that are occasioned by the presence of the phone: the handling of the phone, looking at the phone, pressing buttons on the phone and searching for information in it. The handsfree system occupies her hand and prevents her from using it for driving in another way as well: she presses the ear piece several times, possibly in order to hear the other person's voice better. This is probably due to children's loud background chatter, the background music or the quality of the device.

Similarly with other examples in this report, the above example shows that the driver is sometimes engaged in two or even more distracting activities that are simultaneous with the driving. One particularly striking and extended period that exemplifies this occurs between 0:57–2:01 (lines 16–76). During this approximately 1-minute period the driver talks on the phone (in order to obtain an address and a phone number), searches for paper and a pen, drives through an intersection (a right-

turn across traffic) and instructs the child in the front seat to write down an address. At one point, at an intersection, after she is not able to find a pen to write down an address, the driver visibly orients to the demanding situation by actively attempting to end the phone call ("I might have to ring you back when I'm not driving") when driving begins to require more attention (lines 44–45, at approx. 1:35). However, as we saw above, she fails to end the phone call. Engaging in several actions simultaneously is a multi-tasking event that potentially imposes huge cognitive constraints on the driver. These combined with the driver visibly trying to remember a name and an address (which are important for the driving activity) further add to the complexity of the multi-tasking event. Perhaps in response to these demands, the driver requests for the child passenger's help in writing down the address, but this results in further challenges in that the child has to be assisted in her writing.

Although the driver uses the child as a helpful resource for writing down an address she gets from the phone call it is worth noting that the child on the front seat is not sensitive to the driving situation. After the driver (mother) asks the front seat passenger (daughter) to help her in writing down the address, the front seat passenger asks two questions from the driver and thereby demands the driver's attention (i.e. in addition to driving, the phone call, the task of trying to remember the address and the phone number) (lines 40, 64). The driver also instructs the front seat passenger in the writing task several times during the phone call (lines 52, 55, 59, 60) and after the phone call (75–93).

Summary

This extract provides a particularly interesting example of a driving situation with multiple social and cognitive distractions. The analysis shows how drivers can engage and try to manage multiple distractions simultaneously in a relatively demanding driving situation. It has also been shown that a mobile phone is not just used for having a conversation, but requires attention also in form of repetitive looks and physical handling. A handsfree device does not free the driver from being distracted by the phone when s/he for example searches for information in the phone. The handsfree device also impacts the driver's actions in that she presses it in her ear in order to hear the other person better. The example also further shows importantly that although distractions can be coordinated with driving, some distraction-related actions (e.g. ending a phone call) are very hard to accomplish (cf. starting a phone call which can be more easily coordinated with driving, cf. Haddington and Rauniomaa, accepted). The example also shows that mobile phone calls (rather than being social calls) are often connected to the time and place of the driving situation, i.e. there is a reason for making the call which is connected to the driving situation. Such a *social requirement* can act as a forceful reason for making a phone call, despite the possibly demanding driving situation and the negative impact the phone call can have on driving. Finally, the example also shows the impact of children on the driving, as actors that require attention, monitoring and help but who are not and cannot be sensitive the demands of driving similarly with adult passengers.

3.2.2.9 Example 16: Driver requesting the passenger to answer the phone

Data from "Habitable cars" by Eric Laurier

File: phonecall.mov

Duration: approx. 1 minute

Driving situation

Intra-city driving, light traffic.

Occupant information

Female driver, five children in the car (one in the front, three in second row and one in the third row). Driver's phone rings and she asks her daughter to lift it from a bag and to answer it. The daughter mediates the phone call between the caller and the driver throughout the extract. It is drizzling. Note: times indicate the point in the recording, not the time of day.

NOTE: 'Time' refers elapsed recording time, NOT to the time of day.

Time	Occupant	Action	Driving activity
0:01		Phone rings	Free city driving
0:02	Dvr	Starts talking to the child in the front seat. Requests her to answer the phone (6 seconds). The phone is in a bag; driver looks down to the left (less than a second); keeps alternating glances between traffic and the bag.	Free city driving
0:03	Dvr	Looks down left again (a bit over a second), makes a pointing gesture (one hand on the wheel)	Free city driving
0:05	Dvr	Returns hand on the wheel, looks at traffic, FP leans over to search for the phone	Free city driving
0:05	Dvr	Looks down left (1 second)	Free city driving
0:08	Dvr	Instructs how to answer the phone, makes a gesture, one hand off the wheel (1 second)	Free city driving
0:09	Dvr	Looks left at the front passenger (1 second), FP picks up the phone.	Free city driving
0:10	BP (third row)	Backseat passenger (in the third row) makes a request. FP finds the phone, leans back again and looks at phone.	Approaching a roundabout
0:12	FP	Answers the phone.	Approaching a roundabout
0:13	RRP	Another backseat passenger (child behind the driver) repeats the question / request.	Approaching a roundabout
0:14	Dvr	Answers the request (declines) (2 seconds)	Approaching a roundabout
0:16	FP	Talking on the phone	Slowing down, approaching intersection
0:18	FP	Talking on the phone	Stopped (no traffic)
0:22	FP	Turns to driver and begins talking to her	Picking up speed, driving in a roundabout
0:23	Dvr	Talks to FP about phone call (3 seconds)	Picking up speed, approaching a pedestrian crossing with a pedestrian
0:26	FP	Resumes phone call, talks on the phone (2 seconds)	At the pedestrian crossing
0:28	FP	Listens (3 seconds)	Picking up speed
0:31	Dvr	Talking to FP about phone call (6 seconds)	Picking up speed

Time	Occupant	Action	Driving activity
0:33	FP	Passenger forwards the message from the driver	Picking up speed
0:37	Drv	Talking to FP about phone call (2 seconds)	Picking up speed
0:40	FP	Turns off the phone	Free city driving
0:40	Dvr	Looks at FP's hands / mobile phone (1 second)	Free city driving
0:41	FP	Talks to driver, relays a message from the caller to Dvr (3 seconds)	Free city driving
0:43	Dvr		Slowing down to a speed bumper
0:44	Dvr	Replies, talks to FP (4 seconds)	Picking up speed

Transcription

```
1        ((phone rings))
2   DVR: oh Layla:, phone is ringing, it's in that orange thing there,
3        (.) can you –
4        (.)
5   FP:  (I'll) answer it.
6   DVR: Yes, a little gree:n phone si::gn, you [put it to your ear,
7   RP4:                                        [Can we (come over) your
8        house today?]
9   DRV: and you press that °little green sign°].
10  FP:  Hello?
11  RRP: Can he play with us, Mummy.=
12  DVR: =Not today, cause it's a bit la[te, (isn't it).
13  FP:                                  [wai-]
14       hang on a se]cond,
15       pardon?
16  RRP: (Moms, plea[se].)
17  DVR:            [E]:m, (.) [no::,
18  FP:                        [.hh yes, °hang on a second°,]
19  RP?:                       [Oh, I know, but I (     ) just going
20       home with] three [(      )]. ((talk between backseat passengers))
21  FP:  mom, [(°I don't know who it is°)],
22  DVR:      [who- who is it darling].
23       [cause I'm driving,]
24  FP:  [(°I don't know.)]° ((with an angry face))
25  DVR: I ca:n't,
26       >I haven't got my< hand[s-free].
27  FP:                         [Ehm],
28       she doesn't have her hands-free.
29       (3.2)
30  DVR: Could they ring me at home?
31       whoever it is [Layla]?
32  FP:                [Could] uh (.) you ring at home.
33       (2.0)
34  DVR: In about fifteen minutes.
35       (1.6)
36  FP:  okay. ((turns off the phone)) (.) .hh Stella has an appointment
37       >at the parlour at half past three<.
38       (1.3)
39  DVR: Right.
40       (1.0)
```

Distracting elements

- driver orients to the ringing phone, directs attention to the phone and asks passenger to answer it
- driver talks to passengers (children)
- driver instructs front seat passenger (child) to use the phone
- driver manages two conversations and orients to phone call – these activities are literally simultaneous

Impacts on driving activities

- when the phone rings, alternates gaze between road and phone / bag and takes hand off wheel
- the phone call impacts her actions, asking who the caller is, etc.

Discussion

This extract provides another example of a sequence of events that is occasioned by a ringing phone in a car. It also shows that answering and talking on a phone in cars can be a collaborative activity. It also provides additional evidence for how children do not adjust their actions relative to concurrent driving demands.

The driver is driving in a built-up city area. There is not much traffic. In addition to the driver, there are 5 children in the car, seated in 3 rows in a van. During the example, the driver drives through one roundabout and crosses one zebra crossing. There are several speed bumps. At the beginning of the example, the driver's phone rings (line 1; 0:01). The phone is in a bag in the passenger's leg room. When the phone rings, the driver draws attention to the phone and requests her daughter (in the front seat) to answer it (lines 2–3; 0:02). The front seat passenger starts searching for the phone (0:05). In line 6 (0:08), the driver instructs the child how to answer the phone. At the same time, a child in the very back, in the third row makes a request ("Can we come over your house today.") (lines 7–8; 0:10). The addressee of the request is unclear, but it is made in loud voice and is thus hearable to the driver. The driver does not respond, possibly because she is still instructing the front seat passenger. At this point the front seat passenger answers the phone (line 10; 0:12). Then one of the children, the driver's other daughter, who is sitting behind the driver, repeats the request and specifically addresses the driver ("Can he play with us, Mummy?") (line 11; 0:13) and thus explicitly involves her in the conversation. At the same time, the front seat passenger is engaged in the phone call (lines 13–15). Then the daughter sitting in the backseat insists once more (line 16) and the driver declines for the second time (line 17).

At this point, in line 18, the front seat passenger, who is on the phone, engages her mother in the phone call (0:22). The child whispers to her mother and expresses her frustration about the phone call (line 24). She also makes an attempt to offer the phone to her mother by handing the phone to her (0:23). The driver responds by saying that she cannot take the phone, because she does not have her handsfree device (lines 25–26). The passenger relays this information to the caller (lines 27–28). At this point, the front seat passenger acts as a mediator between the caller and the driver (lines 30–32, 34, 36–37). Consequently, even though the driver is not talking on the phone and is not physically holding the phone, she participates in the phone call.

Summary

In this example we can see that although the driver neither actually talks on the phone nor handles it, the ringing of the phone occasions a series of actions in which the driver visibly pays attention to the ringing phone and requests the passenger to answer it. In addition, the driver is visibly listening to the phone call and participating in it, despite not being directly involved in it. The example also shows that when a driver is not able to respond to and answer a ringing phone it is possible to rely on the help of the passengers. Locating, finding, handling, answering and talking on a phone, which

all are potential driving distractions, thus become actions that are done collaboratively. In other words, interactants have ways of adapting to the needs of the driving situation (cf. Esbjörnsson, Juhlin and Weilenmann 2007). The example also provides further evidence for how children are not always capable of adapting their actions to the needs of the driving situation. As we saw above, while the phone was ringing and the driver was instructing the front seat passenger to answer the phone, and while the car was approaching a roundabout, one of the children made a request that was potentially meant for the driver – and is thereby pulled into and participates in a conversation with the children in the car. Such a request not only makes relevant a response, but the way in which it was produced prefers an agreeing answer. As is the case with children, declining responses often occasion more insisting requests. In the above example, the driver first refrains from responding to the request and after another child pursues (the driver's daughter), she declines the request. This in turn occasions another insisting request by the driver's daughter. Finally, all the above distractions occur within a short time span and sometimes even overlap with each other. The driver is therefore managing several distractions simultaneously while driving in a city environment and approaching and driving through a roundabout.

4 DISCUSSION

4.1 Introduction

Research and experience in Australia and internationally has established that driver distraction is an important issue for road safety. A distraction is an element of the driving situation which demonstrably influences the driver's attention to, and participation in relevant driving activities, and does not itself contribute to relevant driving activities. Distractions can be a significant feature of the ordinary driving environment and experience. Distractions can occur frequently throughout driving, and can occupy significant amounts of driving time. Importantly, distractions are known to potentially negatively impact driving performance and contribute to road accidents.

This study has examined the real-time nature and occurrence of *in-car distractions* and their potential impact on driving activities. The study focused on better characterising the diversity of distractions as they occur as a part of the ordinary natural driving experience. The study set out to consider, in part, just how in-car elements of the driving situation might be or become distracting. Driving activities include, especially, looking and orienting forwards towards the road or other relevant features of the external or internal (in-car) environment to conduct or inform driving tasks, and maintaining hand contact with the steering wheel (or other relevant driving tool i.e. gear or indicator stick, or handbrake). Therefore, a distraction can impact driving activities by, for example, involving the driver to look away from the road ahead, remove a hand from the wheel, re-orient the body away from the forwards driving activity space (e.g. by turning to interact with a passenger), or otherwise attend to something other than driving activity (talk with hands free phone, sing along to music CD, listen to passenger reading newspaper).

This study explored a range of distractions by drawing on data from real-world driving situations. The number of possible sources of in-car distraction appears to be increasing over time, especially with the introduction and more frequent use of new forms of portable technologies. Major forms of in-car distraction include the following: mobile phones; entertainment systems; eating and smoking; other occupants; satellite navigation systems; climate control systems; portable electronic devices (e.g. MP3 players, palm pilots, laptops); maps, or reading/writing other texts (e.g. diary, notes); reaching for or moving objects; grooming activity. There is growing public awareness of the significance of some of these distractions, especially the use of mobile phones, and there are corresponding laws that regulate, restrict or prohibit some distracting activities while driving (e.g. the use of mobile phones). However, the nature and potential impact on driving and safety of some other distractions is very little understood.

The study had the following aims:

- to understand better the nature of distracted driving, and the car as a multi-activity setting
- to document the occurrence of in-car distractions, from origin to response and resolution, in real-time, real-world driving situations
- to identify the features of in-car distractions and explore how they can impact driving activities
- to detail the demands of in-car distractions on the driver and on driving activities
- to examine how drivers manage distractions
- to relate the occurrence of in-car distractions both to events inside the car and in the external driving environment (e.g. traffic, road conditions, road and traffic signalling)
- to examine the complex nature of driving as an attentional, physical, material, embodied social activity
- to increase knowledge of the impact of passengers on driving
- to increase knowledge of naturally-occurring activities and practices

Data were video recordings of naturally occurring real-world car journeys. The Australian part of the study recruited nine volunteer drivers who made a total of 90 journeys, totalling around 27 hours of video recorded data. Journeys varied in length from around four and half minutes to nearly an hour and a half. Journeys were recorded mostly within the greater Canberra region, with a handful of trips from Canberra to Sydney or to major regional towns. The study's quantitative results draw from the Australian data and are therefore based on a very limited population sample and are not generalisable to the wider driving population. In addition to the recorded data collected in Australia, the qualitative study also drew on video recorded data collected from projects conducted by the co-investigator (Haddington) in Finland, and in the UK led by Dr Eric Laurier. The study as a whole therefore is informed by data from journeys undertaken by a further 26 drivers, making a total of 35 drivers, of which the driving behaviours of 16 drivers feature in the micro-analyses reported here. This amount of data is more than ample for the study's aims and emphasis on qualitative micro-detailed analyses of distractions in naturally occurring driving situations. Such micro-transcription and analysis of human activity is very labour intensive and time consuming, but is rewarded with extremely rich data.

Subject drivers were recruited from within the wider university community and through circles of acquaintance. Many recorded journeys also included passengers, and even pets. The video data was collected by mounting discretely (usually by drivers) two cameras within the car: one on the dashboard facing rearwards; the other at the rear facing forwards. Apart from a few exceptions (in Finland), for authenticity recordings were made in participants' own vehicles, and so recorded data was collected from a range of vehicle types. The primary aim for the recordings was always to direct the cameras to capture the behaviours of the driver, and where possible also the behaviours of any passengers. Physical limitations on camera placement meant that often full visual details of passengers could not be captured, but with some minor exceptions most details of driver behaviour were captured to allow analysis of distracting activities and events. Video recordings also recorded audio details, such as conversation and other in-car noises (e.g. entertainment system).

The study was timely because it builds on a number of recent efforts to focus attention on distraction in driving. In Australia, the Australian Transport Council's *National Road Safety Action Plan 2007 and 2008* (ATC 2007) discussed 'distracted driving' as one of its action areas for 2007–2008, within 'Safer road users and safer behaviour'. The Victorian government also recently conducted its *Inquiry into Driver Distraction* (Parliament of Victoria 2006). The study follows closely also on the heels of the recent international conferences specifically concerned with research on 'distracted driving' (Toronto 2005 and Gothenburg 2009), and a Special Section collection on driver distraction of the prominent journal *Human Factors* (2004).

A particular strength of the study was its innovative alternative methodological approach to distracted driving. The majority of studies in the driving and road safety research literature use controlled experimental studies, examine accident statistics, or survey or question drivers on their behaviours. Research is typically positioned in fields within psychology, engineering and design, and accident analysis. This study instead used in-car video recordings of ordinary driving journeys to identify and examine distractions as they occur in real-world driving situations. Although recently more and more studies in driving research rely on recordings of 'naturalistic driving situations' as data (in contrast to recordings made in simulators), these studies are nevertheless frequently planned and involve tests of various kinds. There are also studies and projects that have relied on video recordings made in real driving situations (e.g. the 100-car Naturalistic Driving Study, Klauer et al. 2006), but these studies do, for example, statistical analyses of the relationship between various distractions and accidents or near-collisions. They consider driving differently and not at the moment-to-moment level which we have pursued here, especially in the recording, transcription, and micro-analysis of conversation occurring in real time.

The study used both quantitative and qualitative analytic methods to consider the diversity, characteristics, and development of distractions. The study examined what distractions actually look

like as they originate and develop in situ in the ordinary day-to-day real-time reality of driving. The study therefore aimed to enrich research on distraction in driving by providing new forms of data and analyses, and new forms of findings. The present study joins only a handful or so of very recent studies in the chosen methodology that have conducted such video-based micro-detailed investigations of real-world behaviours *in cars*, and is the first of these to focus on distraction. Such research has begun to consider driving not as an individual and primarily cognitive activity (e.g. McCarley et al. 2004), but as situated and often socially accomplished.

The present study therefore sought specifically to complement the range of research methodologies already actively employed to investigate distraction in driving. So, rather than define and examine distraction according to its impact on measures of driving performance, and according to driver variables (such as gender, age), this study instead drew on specialist expertise and methods in the micro-transcription and analysis of video recordings of naturally-occurring activity. The study presented detailed analyses of examples of in-car distractions. To our knowledge it is the first ever such study of distraction in driving. The value of an observation form of methodology is supported by the Australian Transport Council's *National Road Safety Action Plan 2007 and 2008* (ATC 2007: pp.41–42) which identified the value of observation-type studies for investigating distractions to driving (see also Haigney and Westerman 2001). The present study therefore complements the survey, laboratory, and crash studies which informed the ATC's *Action Plan.* The potential value for using direct observations of driving was also noted and called for at the first International Conference on Distracted Driving (in Toronto, 2005; Hedlund et al. 2006:vi).

The study took the following analytic approach to in-car video recordings of actual ordinary driving journeys:

1. Investigators identified moments on the recordings when in-car distractions occurred. Investigators documented the frequency and duration of particular types of distraction, and where relevant noted details of driving activity and the driving situation.
2. Investigators examined selected focus instances of in-car distractions, and these were transcribed and/or described and analysed in micro-detail with regard to their features and real-time occurrence. These analyses therefore examined how drivers coordinate distractions and driving activities, and exactly how distractions impact and can potentially impair driving activities. These accounts therefore provided micro-detailed descriptions of actual driver behaviours, as in-car distractions occur in real-time, and with reference to relevant driving events and external circumstances.

In summary, the following questions represent the general questions and interests pursued by the study:

- How do drivers either initiate distractions themselves, or react to distractions when they occur outside their control?
- How do drivers coordinate and manage in-car distractions with the real-time activities for driving (e.g. manipulating vehicle controls, attending to relevant events of the external driving environment)?
- What are the detailed *in situ* features of in-car distractions? i.e. what do in-car distractions look like, and how do they play themselves out, in real-time real-world driving?
- What kinds of actors (i.e. who and what) are involved in these in-car distractions?
- How do in-car distractions occur and develop relative to one another?

4.2 Quantitative results

The study's principal aim and contribution was to provide micro-detailed qualitative analyses of real-time occurrence of distractions in real-life driving situations, to examine their nature and their

impact on driving activities. Therefore the quantitative results are indicative only for the small sample (n=9) of drivers who were recruited in Australia to produce video recordings of driving during naturally occurring journeys. The study did not seek to present comprehensive and representative quantitative findings on the general occurrence of particular distractions, or their occurrence relative to characteristics of drivers, passengers or journeys. The does not claim that the quantitative results can be generalised to the wider driving population. Nevertheless, one strength of the recorded data is that they do represent nearly thirty hours of real-life driving, and 90 separate journeys. So the quantitative results can still be valuable at least for adding to results of other studies, and as indicative of the possibilities for normal behaviours of individual drivers.

The quantitative data identified occurrences of many different forms of distraction, including all the major forms of distraction except the use of a satellite navigation system. In terms of occurrence of distraction per number of journeys, the most frequently occurring distractions were, in order: talking with passengers (100%); grooming (91%); using entertainment system (58%); searching/reaching for objects (44%); singing/drumming to music (40%); and temperature/climate control (30%). There was then a large drop to the remaining 5 distractions: eating/drinking (8%); making mobile phone calls (7%); texting (4%); receiving mobile phone calls (2%); and reading (1%).

Perhaps one immediately surprising finding is the relative limited occurrence of mobile phone use. This outcome however might reflect drivers' generally greater awareness of this form of distraction, and especially as an illegal and often socially discouraged activity while driving (cf. Walsh et al. 2008). Although drivers were not aware of the specific focus of the study on distraction, they were aware they were being video recorded and so they may have modified this aspect of their behaviour. The outcome might also reflect the relatively small sample, with only nine subject drivers (in the Australian recorded data), and the experience level (and associated age) of the drivers (there was only one novice driver, <5 years driving experience). For the few occurrences of mobile phone use the study was still able to conduct valuable qualitative analyses, showing how their use might figure in driving activities .

The most frequent form of distraction, in terms of its occurrence per journey, was talking with passengers, which occurred in 100% of the journeys in which one or more passengers were present. A recent study conducted in Britain by the Department for Transport (DfT 2009: 10) reported that in 40% of all car journeys there is more than one person in the car. These results combined suggest that conversation with passengers is likely to be a very common form of distraction. The study also calculated for each journey the percentage of time spent in conversation. This varied greatly from 2%, almost no talk, to 100%, a continual state of conversation for the whole journey. The average percentage of journey time with conversation between driver and passenger was around 60%. This suggests that conversation between driver and passenger is a significant form of potential distraction. The study also noted occurrences of conversation between passengers, i.e. not involving the driver, but there were too few of these journeys for substantial comment. Significantly however, the study's qualitative analyses (see below), showed that a strict distinction between types of conversation, as involving the driver or not, are unhelpful. This is because conversation between passengers can quickly involve the driver, at either the driver's or a passenger's initiative. In addition, the qualitative part of the study is able to provide preliminary evidence for the different ways in which adults and children participate in and are able to assess a driving situation and to modify their behaviour according to the demands of the situation. More research is required to better understand how the driver talking to, monitoring and helping children impacts the driving activity (cf. Barker 2009).

A particularly interesting finding concerned the relative common occurrence of grooming activity. Grooming was interpreted to include any attention of the driver to some aspect of their body, for example scratching, adjusting clothing, handling glasses, applying make-up or skincare products, or using a handkerchief. Grooming occurred in 90% of journeys, and so after talking to passengers was the most commonly occurring form of distraction. Frequency of grooming activity per journey

appeared to vary greatly according to the driver and the individual circumstances of the journey. Duration of the journey did not affect the possibility for frequency of occurrence. For instance, in one journey of 17:20 the driver groomed only once, and for just one second, whilst another driver groomed 29 times, for a total of 1:20, in a shorter journey of 13 minutes. The amount of time spent on grooming activities ranged from 0:01 to 3:12, though in 65 of the 82 journeys with grooming the time spent grooming was less 0:30 or less. As an example of extended grooming, the driver who spent 2:33 grooming was applying moisturising lotion to her hands, face and arms. The qualitative analyses showed that grooming, as a driving distraction, provides a challenging topic. Grooming activities were found to vary greatly in their nature and possible impact on driving.

Adjusting the entertainment system was also a commonly occurring source of distraction, featuring in 52 of 90 journeys (58% of journeys), however this occupied less of drivers' time and activity. The number of times the driver adjusted the entertainment system per journey ranged from just once (for 0:01) to 10 times (for a total of 0:23), but most commonly between one and five times (45 journeys). Time spent adjusting the entertainment system was lower than for other distractions, ranging from 0:01 to 0:32 over the journey, though in most journeys the duration was 0:15 or less.

One distraction that is recognised to present a major potential threat to safe driving is reaching/searching for an object. This study noted that this distraction occurred in 40 of 90 journeys (44%), and the number of times per journey ranged from once to 16 occurrences, though once was most common (20 of 40 journeys). Although time spent reaching/searching for objects varied between 0:01 and 3:12, generally drivers spent very little time on this activity, usually less than one minute (36 out of 40 journeys). Nevertheless, the nature of this activity is such that it can engage both the driver's gaze and hands away from driving activities, often simultaneously. Therefore this distraction is a valuable focus for qualitative micro-analyses, and the study provides a number of these cases.

We included the category of distraction 'singing/drumming to music' because this occurred in relatively many journeys (40% of journeys), and seemed to represent both a higher level of attention and embodied involvement in use of the entertainment system than just listening, and a different form of involvement to adjusting the entertainment system. This distraction however seemed to occupy relatively small amount of time driving, in 26 out of 35 journeys the duration was less than 1:00.

The study found that in 27 out of 90 journeys the driver adjusted the temperature and climate control system, representing (30% of journeys). While this appears therefore to be a quite common distracting event, in any particular journey it did not occur often, commonly only once (13 of 27 journeys). Drivers spent very little time adjusting temperature/climate control, between 0:01 and 0:19, and most commonly only taking one or two seconds (in 14 out of 27 journeys).

As mentioned above, mobile phone use was a relatively rare occurrence in the study's Australian data set. In only 6 of 90 (nearly 7%) journeys did the driver make a mobile call, in only 2 of 90 (2%) of journeys did the driver answer a mobile call, and in only 4 of 90 (4%) journeys did the driver use their phone for texting. For reasons outlined above we do not present these findings as in any way representative of the occurrence in the wider driving population. For example, only two of nine drivers used their phone for calls, and only two of nine drivers used their phone for texting. Nevertheless, in the wider population drivers are known to often use and talk on mobile phones while driving. The qualitative part of the study therefore is able to shed light on precisely how and when mobile phones are used while driving in real-life situations, how their use is temporally adjusted with the driving activity, and how handsfree devices are used while driving. These findings provide an important background both for further qualitative and micro-detailed research and experimental research.

In the Australian study data set eating and drinking occurred in only 7 of 90 (8%) journeys. This distraction seemed to be sensitive to circumstances for individual drivers and journeys. For example, one driver was seen in three journeys to eat briefly, for between 0:01 and 0:12, on each occasion eating mint. This eating activity appeared to be a habitual feature of driving for this individual, as evident in the collection of mint containers stored in the central console. The most significant eating behaviours, in terms of duration in single journey, were by one driver who ate five times for a total duration of 5:36 in an approximately 15-minute journey, another driver ate 29 times for a total duration of 9:17.

Lastly, we considered the category of passenger behaviours as a separate distracting influence. This is because it is recognised that passengers can impact the driver and driving activity. Passengers were present in 46 of the 90 journeys (51%). Earlier we considered passengers as a participant in conversation with the driver. Passengers also conversed with other passengers. In 9 of 90 (10%) journeys there was more than one passenger, and most of these journeys the passengers conversed with one another. The study's qualitative analyses show how passenger-passenger conversation can actually also involve the driver. The study also noted occurrences where passengers made (2 journeys) or received (2 journeys) a mobile phone call. Clearly these figures cannot be representative of the wider driving population, but we include their mention to give a sense of the range of possibilities for forms of distraction observed. Also, the study's qualitative analyses show well just how a 'passenger' mobile phone call can become a significant distraction to the driver, and impact driving activities. The data also show occurrences of passengers adjusting the entertainment system (12 of 46 journeys, 26%). After talking in conversation, this was the most frequent passenger behaviour. The number of occurrences per journey ranged from once (most commonly) to eight times. Duration of time spent adjusting entertainment system ranged from 0:01 (once) to 1:38 (in a journey where it was adjusted eight times). Passengers also adjusted the temperature/climate control system (6 of 46 journeys, 13%). Again, we do not present these figures as in way representative and generalisable, but only as potentially indicative of different forms of distraction for a driver. In this case, this passenger behaviour is potentially significant because the systems are physically close to the driver and the driver's driving activities (e.g. operating the gear stick), and in the driver's possible field of vision. Such behaviours can possibly actively distract the driver and impact driving activities.

4.3 Qualitative results

The qualitative micro-analyses presented in Results (section 3.2) captured and explored a wide range of distractions, and representing actual events for distractions in real-time real-world driving situations. All major recognised forms of in-car distraction were presented in the analyses, with the exception of use of satellite navigation systems. For example, the analyses considered mobile phone use, passenger conversations, eating, various types of grooming activity, and use of the entertainment system. Commonly, the analysed examples show exactly how and when relative to driving activities and changes in the driving situation, drivers engage in distracting activities.

These qualitative analyses represent the primary and distinctive contribution of this study. The principal value of the analyses is their rich presentation of the moment-to-moment emergence and development of individual distractions, and who (participants - driver, passenger) or what (e.g. object) is involved. It is possible to identify some common threads and points of emerging interest.

Distractions can be finely coordinated and timed with features of the driving situation

Some examples show how drivers strategically coordinate or time a distracting activity with, or integrate it into, the evolving demands of the driving situation. Specifically, examples show how drivers stop and start particular distracting activities in ways that orient to the nature and changes in traffic flow, and changes in traffic signalling (traffic lights, stop signs) (but cf. Horrey and Lesch

2009). For example, many distractions take place when the car is slowing down, is stopped or is picking up speed. It seems that at these moments drivers frequently engage in such distracting activities, such as:

- handling, sharing and using a mobile phone,
- searching and reaching for an object,
- orienting to or helping passengers, and
- adjusting the entertainment system.

The examples also show that it is often at these moments that drivers remove both hands from the wheel, and take quick glances at objects, phones, bags, passengers, initiate phone calls and so on. Drivers therefore seem to orient to the potential impact on driving of distracting activities. Drivers often try to find, or monitor and take advantage of, opportunities in traffic to engage in distracting activities, and thereby to coordinate distraction activities with moments with lower driving demands. The examples also show, however, that drivers' attempts to coordinate distraction and driving can result in brief moments at the start and/or end of the distracting activity when the demands of driving and the distracting activity overlap. One example (Example 14) showed a driver attending to a sleeping child when the traffic stopped, but that the distraction activity continued after traffic again started moving. Another example (Example 13) showed the driver requesting for her mobile phone just as she approached an intersection with red lights and so was slowing to a stop, but not yet stopped. Then furthermore, despite indications that the phone call was coming to an end, this distracting activity overlapped with resumption in traffic movement and the driver shifting lane.

In other examples we saw how the use of gestures and speech were coordinated with the demands of driving. In one occurrence (Example 9) while the car is moving at normal speed, the driver was in conversation with the front seat passenger and was seen to modify and interrupt the delivery of his talk in order to attend to traffic and road conditions when turning and merging with a faster lane. In another example (Example 10) the driver's telling of a detailed story about happenings at work involved elaborate hand gestures, such that the driver switched between her left and right hand depending on the hand needed to turn left or right while executing a series of turns. Consequently, the analysis suggests that drivers' talk and gestures, as integral elements of interaction with passengers, were coordinated with and impacted by the demands of the driving situation. Although this does not suggest that interaction with passengers never impacts the driving activity, it shows that further research is required on how and when driver-passenger interaction impacts driving.

All in all, these examples provide evidence that while drivers attend to the potential of distractions to impact driving by coordinating distractions with moments of low driving demand, and so seek to minimise distractions' impact, sometimes in certain situations such coordination is very difficult and overlapping activities occur. We note that these are moments (stopping, starting off, moving slowly) at particular locations (intersections, traffic lights) when drivers engage in distracting activities, but both when/where significant attention to driving is often required because of changing circumstances beyond the driver's control, and when/where the majority of driving accidents happen. Furthermore, distractions in which the driver does not or is not able to look forwards, and distractions in which the driver is not able to alone control how the distraction develops (e.g. telephone conversation, attention to children, interaction with children) may require more from the driver. On the other hand, distractions which the driver can control, and can suspend and resume to fit the demands of driving (e.g. reading a map, grooming, interaction with adults), may impact driving less. Further research is therefore required to better understand how distractions occur with respect to specific driving situations and when and how their development can or cannot be controlled (e.g. the endings of phone calls).

Distractions can extend over time

Examples show how distractions may occur not as a one-off event, but can extend and develop over time, sometimes over a substantial period of time of many minutes.

Such distractions, once begun, may be suspended and resumed to fit the evolving demands of driving activities and the ever-changing driving situation. Example 1 showed how the driver first turned the entertainment system on when stopped at lights, but returned his hand to the wheel as the lights changed and traffic moved off. He then made subsequent adjustments to the system while in motion. Example 5 showed how the driver applied moisturising lotion by first placing a quantity of lotion on her arm, and then gradually applying the lotion to her arms and face in various stages coordinated with the demands of driving. Other examples (Example 9, Example 10) show how conversation with passengers can extend over many minutes, and across various driving situations. One driver used the front seat as a location for storing a handkerchief, allowing easy access to the handkerchief to blow and rub his nose over time as needed throughout some minutes of the journey (Example 2).

Distractions can be planned, predictable, controlled

Some examples show how drivers anticipate and plan for some distractions, and are able to control distractions' timing and development, for example in the use of objects, grooming, or eating. For example, eating often involves the driver bringing food/drink into the car, either for consumption during a particular journey (Example 12), or stored in advance in the car for consumption during any journey (Example 4). Another driver stored a bottle of moisturising lotion in the car to be able to apply it throughout the journey (Example 5). We saw how one driver placed a handkerchief on the front seat so it would be ready and accessible when needed (Example 2). Another driver changed her glasses by switching the pair she was wearing with another pair stored in an overhead compartment (Example 3). One driver pulled over to read a map (Example 6). In one case (Example 16) we also saw that specific moments of extended distractions (e.g. starting mobile phone calls) can be coordinated with the demands of the driving. The driver in this example requested the phone from a passenger who had answered the phone a moment earlier. In addition, drivers can ask for the passengers' assistance with particular distractions as we saw when one driver asked passenger to answer a phone (Example 16) and to write down an address (Example 15). In these occurrences the drivers were able to attempt to control the ways in which the distraction occurred, relative to the demands of driving.

Distractions can be unplanned, unpredictable, uncontrolled

By contrast, other examples show how some distractions can be unpredictable, and can make immediate demands on the driver. Incoming phone calls in general cannot be controlled. For instance, in Example 13, an incoming phone call to the driver's phone occasioned the driver's looking at the phone. Incoming calls also got the drivers' attention and occasioned their requests to a passenger to answer the phone and instructions on how to answer it (Examples 13 and 16). In one example (15) we saw how the driver forgetting an address list at home made her make a phone call in order to get the information that was necessary for continuing the journey. In one example (12), the phone call was cut off, after which the driver took the phone in her hand, alternated her gaze between the phone and the traffic while handling the phone and then eventually redialled. What is noteworthy is that also a passenger's ringing phone can in some situations be a potential distraction. We saw, for example, how a call to a passenger's mobile phone (Example 8) became relevant for the driver when the developing conversation indicated that it might be necessary to change the journey destination. The driver's emerging participation in the conversation involved turning to look towards the front left passenger, and then a rear seat passenger, and also to lift his hand from the wheel to make a gesture.

As regards other unplanned distractions, we saw also how a dog suddenly falling off a back seat prompted the driver to turn his head to the right in the direction of the associated noise, and then to engage in related conversation with the front seat passenger. Another driver was prompted by a feature of the passing external road environment to initiate a conversation with the front seat passenger. This involved turning his head to look towards the passenger, and also lifting his hand from the wheel to point at the feature.

These distractions are not timed to occur conveniently at moments of break in driving demands, but require the driver to coordinate the demands of both distraction and driving. For example, the dog fall coincided with the driver's execution of a left hand turn. Children, in general, provide an endless resource for distractions. Children's behaviour and actions often cannot be planned in advance. What further adds to the complexity of child passengers as potential distractions is that they are not able to be aware of and evaluate the driving situation in ways similar to adults and so are less able to adjust their actions relative to it. In other words, children are not sensitive to the sequentially and continuously changing demands of driving. Rather, as we saw in some examples, children often require attention. For example we saw that children produce questions, requests for help and other attention-seeking and attention-requiring actions that socially make relevant the driver's response and if not responded to are often follow by more insisting actions. These actions frequently coincide with driving situations that also require the driver's careful attention.

Distractions occur relative to one another

Example analyses also showed how distractions can occur relative to one another. They can occur (1) one after the other (i.e. distractions are serial), (2) so that one distraction leads to or makes relevant another (i.e. distractions are sequential) or (3) simultaneously. As for examples of the first group in which one distraction followed another, in one case (Example 4) we saw a driver move from a reaching activity to a grooming activity (using lip balm) to an eating activity (a mint). In another case (Example 5) we saw how a driver integrated a number of different distractions over a period of time: she used her mobile phone; handled a CD case; adjusted the entertainment system; groomed her hair and adjusted her glasses; and engaged in an extended grooming activity to apply moisturising lotion over many minutes. Analyses showed how drivers stopped and started these different distractions, or performed distractions in a series.

Second, analyses also suggested that it is possible that involvement in one distraction can either lead to, provide an opportunity, make relevant or at least facilitate, another distraction. In other words, distractions occur sequentially. For example, while telling an extended story in conversation with a front seat passenger, one driver regularly lifted her hands from the wheel to make accompanying gestures and with her hand off the wheel would also perform quick grooming activities. Another driver combined eating and interacting with and feeding her children in the rear seats, while also reaching for and talking on her mobile phone. Additionally, in Example (15) we saw how a mobile phone conversation occasioned a search for a pen and paper that were needed for writing down information given in the call, and this in turn occasioned the driver assisting the child passenger in writing (spelling) the information. In another case (12), we saw how a phone call being cut off resulted in the driver redialling.

Third, the analysis also showed that sometimes distractions actually occur simultaneously, which can dramatically increase the demands of the driving situation. This became evident especially in those situations that involved children (Examples 12, 15 and 16). In one instance (Example 16), we saw how after a mobile phone had started ringing, the driver instructed her daughter (sitting in the front) to answer the phone. At the same time, two children in the backseat asked a question from the driver. At this point the driver was approaching a roundabout. In another example (16), the driver was on the mobile phone and trying to memorize an address and a phone number and instructing her child to write down the address on a piece of paper.

Distractions are physical (embodied)

Numerous examples demonstrated the real-time embodied and situated nature of distractions, as enacted within and relative to the physical constraints of the car. The examples show the physical demands on drivers to engage in distractions, and the ways that drivers use the material and spatial resources of the car to engage in distractions. In some examples (e.g. Example 8), we saw the driver use the rear-view mirror, or turn his/her head and body to varying degrees to the left, or even the right, to interact with front and rear-seat passengers or respond to distracting events.

In one example, we even saw the driver, while stopped, lift up from the seat and turn her entire upper body in order to attend to a child in the backseat. Although the car was at a stop, during this activity the driver was not able to monitor the traffic ahead of the car and did not see the traffic start moving. In those cases we saw how the type and extent of physical involvement in the interaction was sensitive to the nature and course of the conversation or the interactional moment. For instance, in Example 8, for the simple telling of a story the driver used the rear-view mirror, and so maintained possibility for easy access to look towards the road ahead. However, as the conversation became more complex (when one passenger answered a call to her mobile phone), the driver consequently became more involved and first turned his head towards the left front seat passenger, and later turned his head more fully to the left to interact with the left rear-seat passenger. He also lifted his hand from the wheel to gesture, and later to rub his chin. In another example (Example 3) we saw how changing glasses involved the driver in a complicated manual manoeuvre, which involved shifting glasses from one hand to another, to and from her head and lap and the overhead storage compartment, and also holding glasses with a hand at the steering wheel. It involved looking regularly to and from the road ahead and the overhead compartment.

Similarly, another driver looked backwards and forwards from the road ahead to a map on the front seat (Example 6). In other instances (Example 7 and 15) we also saw how reaching for objects in the glove compartment or the leg room in front of the passenger seat or the use of a handsfree loudspeaker system for a mobile phone occasioned the repositioning of the driver's entire upper body. We also saw how the end of a child passenger's phone call (Example 12) made relevant the driver's extending her arm to the backseat in order to reach for a handsfree device and then a mobile phone. In sum, the analysis has shown that many distractions are not just cognitive but can also impact the driver's physical involvement and attention in a situation, for example, in form of looking away, removing hands from the steering wheel or even moving the entire upper to the side or to the back in order to attend to a non-driving activity.

Distractions can originate from the driver or from elsewhere

Some distractions clearly originate from the driver. Drivers can for example commence eating (Examples 4 and 12), start a mobile phone call (Example 7) or become directly involved in a phone call by requesting the phone to themselves (Example 13). Drivers can also use and apply objects and artefacts while driving (Examples 2–6) and initiate conversations (Examples 9 and 10). However, distractions can also be started by or originate from passengers and technologies. In these cases, responsive actions are often required by the driver. On the one hand, passengers can initiate conversations or in other ways request for the driver's attention. This happens frequently especially with child passengers. On the other hand, a driver can for example treat an in-coming phone call or a text message as requiring attention and involvement. In other cases, some unprecedented events inside the car (e.g. a dog falling off a seat, a child doing something unexpected) can divert the driver's attention momentarily from the forwards driving situation to the event.

Distractions are designed for

Some distractions are specifically designed for by car manufacturers. That is, features of vehicle design assume and allow for the occurrence of various forms of distraction. We saw in detail how

drivers make use of such features in real-time. For example, we saw how drivers used the central console to store and access a container of mints (Example 4) or an overhead compartment to access and change pairs of glasses (Example 3). People in cars will always eat mints, or change glasses, whether or not the car has a purpose-designed location for this, and they will also drink coffee, put on makeup, store reading material, etc. Locations designed for these activities facilitate such activities and their coordination with other activities, and with driving and can minimise their potential to negatively impact driving. These examples are therefore valuable for discovering just how such locations for distracting activities (and also entertainment and climate control systems, and GPS systems) are actually used in real-world situations. Further, the analyses here can allow investigation of not only matters of ease of use relative to driving, as might be considered in simulated scenarios in the design lab, but also how such distractions are coordinated with other possible real-life real-time distractions.

Distractions are differ in qualitative terms

The analysis also shows that it is possible to make qualitative distinctions between activities that are easier coordinate with driving than others. For example, it is possibly easier to stop or postpone (e.g. when stopping in traffic or at traffic lights) distractions that involve only the driver (e.g. adjusting the entertainment system, searching for an object or preparing for an outgoing phone call) than to stop an activity that requires collaboration with another person (e.g. ending a phone call, cf. Schegloff and Sacks 1973). Incoming phone calls provide a similar kind of uncontrollable distraction in that drivers cannot anticipate the exact moment of the call. Although drivers have the possibility to ignore an incoming phone call, preliminary analysis suggests the phone's ringing (i.e. the summons) is socially treated as requiring a response in form of an answering action: drivers usually react to the ringing phone by searching for, locating and answering it (see also Haddington and Rauniomaa, accepted; cf. Schegloff 1968). However, driver preparations for an outgoing call (reaching for, looking at the display, pressing buttons) seem to be qualitatively different in that they can be adjusted more easily with the traffic flow and the traffic situation.

The analysis thus suggests that it is insufficient to consider different technologies (ranging from entertainment systems and GPS navigators to mobile phones) as mere distractions. It is possible that a technology when it requires the driver's attention or appropriate response is more distracting (a ringing phone) than some other technology (e.g. using air conditioning or adjusting volume in entertainment system). Additionally, although handsfree devices in principle absolve drivers from keeping a mobile phone in their hands, drivers are still often required to interaction with phone itself, i.e. look at the phone, press buttons on it and physically handle the handsfree device. Moreover, such technologies, although designed to help drivers and free their attention to driving, do not provide the help they are designed to do or they are not used in the way they are designed to be used.

This study has only begun to explore how the features of different technologies for in-car distractions are important, how they might require qualitatively different levels of attention and involvement, and thereby how they could impact the driver's driving activities in different ways. More empirical research is therefore required to better understand the different ways in which qualitatively different distractions pose hazards to driving.

4.4 Implications

This study has introduced a new qualitative and empirical methodology to driving safety research. In doing so it has aimed to supplement prior driving safety research by providing a complementary way to understand, approach and study 'distractions' as embodied, real-time and real-life phenomena in cars. It hopefully shows that distractions do not just pose cognitive constraints to drivers but become evident and result in the drivers' physical and embodied actions. The analysis

has been able to describe in detail the shape and quality of already recognised driving distractions and to identify *when* they occur, *how* they develop and occur and *how* they are responded to and managed together with the simultaneous driving demands. Specifically, this study has been able to describe the role of passengers in cars as sources of distractions and as participants that can help drivers with different distractions. Similar research in the future can further help to improve the understanding of when and how distractions occur and how they develop and impact driving and drivers' actions.

5 CONCLUSION

Through its quantitative and qualitative analyses of in-car video recorded data from ordinary driving journeys this study has furthered understanding of the nature of distracted driving, and the car as a multi-activity setting. The study's analyses documented the occurrence of in-car distractions, from origin to response and resolution, in real-time real-world driving situations, to identify the features of in-car distractions and explore how they can impact driving activities, such as looking and orienting forwards to the road ahead, or to the relevant surrounding environment, and maintaining hand-contact with the wheel. The study has shown in detail how drivers manage distractions in real-time in real-life journeys. Where possible from the video data, the study has also related the occurrence of in-car distractions to events and changes in the external driving environment (e.g. traffic). The study examined the complex nature of driving as an attentional, physical and material (embodied), and social activity, and in particular it increased knowledge of the impact of passengers on driving.

The study's principal aim and contribution was to provide micro-detailed qualitative analyses of real-time occurrence of distractions in real-life driving situations, to examine their nature and their impact on driving activities. Drivers were recruited in Australia to produce video recordings of their ordinary driving, during naturally occurring journeys. Drivers set up cameras to record driving from both front and rear views. Given the scope of this small study it was possible to collect a limited amount of recorded data (nearly 30 hours) and from only a limited number of drivers (n=9). This amount of data is more than ample for the detailed micro-analyses required. However, the small driver sample size means that the quantitative results are indicative only for this study's population, and not necessarily characteristic of the wider driving population. Nevertheless, the recorded data do represent nearly thirty hours of real-life driving, and 90 separate journeys, and so the quantitative results can add to results of other studies, and can be seen as indicative of the possibilities for normal behaviours of individual drivers. The data can also show how common such distractions can be across different drivers, how frequent they might be throughout particular journeys, and how significant their duration can be as a proportion of the driving time. In addition to the Australian data, this study drew on data collected in Finland and the United Kingdom (approximately 80 hours altogether). These data were used for the qualitative part of the project only.

The study's primary contribution is therefore provided by its novel method for the study of distraction, relative to the overwhelming number of studies using controlled experimental methods, or based on data from surveys and interviews, or accident statistics. Future larger studies, using larger samples of drivers, could further highlight details of distractions, or could collect and examine instances of particular forms of distraction (e.g. mobile phone use, eating, grooming) to determine their common and general features in natural real-life situations.

Through the micro-analytic research method, this study has analysed empirically and in detail various examples of in-car distractions. In particular, the study's contribution has been to show just how in-car distractions occur and especially to highlight and detail the actual nature and timing of their occurrence in real-time, and relative to one another and to the demands of driving. Thus, this research design has provided new qualitative findings about driving distractions. It has shown for example that distractions can, on the one hand, occur under the control of the driver, even in planned ways. Examples of such planned and controlled distractions include some grooming and eating activities, and in some cases also phone calls. On the other hand, the study showed that some distractions may be highly unpredictable so that they force the driver to react and accommodate to the distraction while driving. Examples of such distractions are participation in conversation (especially with children) and orientation to a ringing mobile phone. The study has also shown that distractions can be coordinated with the demands of driving so that their negative impact to driving is minimal. It also has shown that distractions can extend over time, to be halted or postponed and

resumed. It also shows that different in-car distractions can be connected to each other in complex ways so that they occur in series (one after another), in sequences (one making relevant, providing the possibility or even requiring or leading to another) or simultaneously. The analyses also show that distractions should not be considered as providing constraints to the driver's cognitive capacities only. Rather, as the examples suggests, distractions involve physical and embodied actions, such as looking away from the road, and gesticulation and movement of the upper body. Distractions also originate from very different sources, for example from the driver, from different technologies and from passengers.

These findings and the examples in this report highlight the real-life complexity of distractions, and what it is that drivers attempt, or are called on, to do. The analyses show in detail how the drivers engage in multiple distractions in real-time and relative to ever-changing driving activities and situations. This study has provided a view of driving distractions that hopefully enriches recent driving research and raises issues that research in the future can shed light on. It has identified and studied different kinds of distractions that visibly impact driving in different ways. The qualitative focus has also provided new findings regarding already well-known distractions by being able to identify specific moments where a distraction can have an increased negative impact and by being able to show how distractions develop in time.

The study's analyses and findings can benefit road safety by informing driver training programs, and also potentially relevant road safety related guidelines, safety campaigns, or even laws. Drivers can be made more aware of the range of possible distracting events and how they impact driver behaviour. Drivers can better identify the moments when distractions can occur, and how distractions can involve the driver, or others in the vehicle, and how they can negatively impact driving activity, for example by leading the driver to look away from the road, or remove their hands from the wheel. Drivers can therefore be empowered to better avoid or control distractions. While there is at least public awareness and legislative response to some distractions, such as mobile phone use, the potential impact on driving of other distractions, such as grooming, eating and drinking, or passengers, is far less well identified and understood. These distractions are unlikely ever to be subject of legal restriction.

The study can potentially also inform car design. Increasingly, car designs can seek to maximise driver convenience and comfort by including features to allow drivers to personalise the car-space and make it more comfortable. These features include technology systems for entertainment, satellite navigation, and temperature/climate control, but also storage systems, for example for food or eye-glasses. We saw in this study that while such features may well increase convenience and comfort, they also design distraction into the driving experience. Detailed analyses of exactly how drivers coordinate specific distractions with driving, moment-to-moment in real-world driving situations, may help designers to further minimise the demands on driving.

The study concludes that in-car distractions are a pervasive feature of driving, whether the driver is alone or has passengers, and make activity-management demands on drivers in rich and complex ways. Distractions require drivers' moment-to-moment monitoring and their ability to distribute to different activities their available visual (gaze) and physical (manual) resources, and relative to features of the local material and spatial environment.

6 SUMMARY

In-car distractions can seriously impair driving and potentially contribute to accidents. In-car distractions include mobile phones, entertainment systems, interaction with passengers, and most recently satellite navigation systems. This study investigates such distractions by providing micro-detailed descriptions and analyses of their occurrence and impact on driving activities, such as looking towards the road ahead or handling the steering wheel. The study uses naturally occurring data, in-car video recordings of driving in real-world driving situations. The study examines in detail how different forms of in-car distractions develop in situ in real time, and relative to driving activities and to one another.

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8 APPENDIX A: ETHICS APPROVAL DOCUMENTS

Project information sheet

Centre for Educational Development and Academic Methods
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Dr Maurice Nevile

INFORMATION SHEET

Research Study

Investigating ordinary driving activities

In this research study we are investigating people's ordinary driving activities. This study is funded as a Road Safety Research Grant awarded by the Commonwealth Department of Infrastructure, Transport, Regional Development and Local Government (2008–2009). The study is interested in better understanding what driving actually involves in present day conditions, including for example the kinds of cars which people drive and the characteristics of roads and traffic. The study is being conducted at the ANU in collaboration with a researcher at the University of Oulu in Finland.

Why are we carrying out this study?

Research and experience has shown that drivers are an important part of a safe road system. This study is interested in the ordinary activity of driving. Many studies rely on asking people about their driving. Very few research studies consider the details of how people actually drive. This study aims to understand better exactly what is involved in driving.

An intended outcome is to inform public awareness and road safety campaigns, and so potentially improve road safety.

What does the research involve?

The study is interested in ordinary driving activities, in how people typically drive in real-world driving situations. Therefore, *the study will collect digital video recordings* of people driving for ordinary trips they make for their own personal reasons. Cameras will be mounted in-car to have no impact on driving activity. When you leave the car at the end of a trip you will be asked to dismount the cameras and either remove and take them with you,

or conceal them in the car (e.g. in the boot, or in a green shopping bag). This approach to collecting video data has been conducted in similar overseas road safety studies (e.g. in the UK and France), including in the Finland by the co-investigator of the study.

It is important to note that *the study does not involve any form of experimentation or control of driving*. Participants will *not* be given any specific instructions for driving. Participants will *not* be asked to drive in a different way, or to do anything you would *not* usually do when you drive. The study is *not* interested in making qualitative judgements about participants' driving. The study does *not* investigate participants' driving ability, or knowledge, or views, or experiences of driving. We will *not* ask participants about their driving or comment to participants about their driving.

The study will seek 10 participant drivers, including five experienced drivers (over five years' driving experience) and 5 novice drivers (less than five years' driving experience). We hope to collect about 3 hours of recording for each driver.

Your participation

You have been considered as a possible participant *only* because you are believed to be a licensed driver who might be willing to be video recorded while you drive. If you do participate in this research study, we will organise with you a suitable time to collect data. This will involve mounting two cameras in your car, or loaning to you a car (automatic transmission) in which the cameras have been mounted.

Your participation is purely voluntary, and there will be no adverse consequences if you decide not to participate. You may withdraw your participation in the study at any time, and you do not need to provide any reason. If you withdraw we will not use any of the data you have provided to us. All data will be destroyed after five years in keeping with the ANU policy for Responsible Practice of Research.

Participants need to be over eighteen years of age and have a current valid driving licence that gives them legal permission to drive a motor vehicle in Australia. Participants must be driving the car when the camera is mounted and must be the primary or sole driver of the car.

If you participate it is possible that you will have passengers in the car. The study will not use as data any video recordings data unless a consent form has been completed for each passenger. If your own children are passengers will be asked to sign the consent form on their behalf.

Reporting

In the first instance the results of the study will be reported as a final report to the Commonwealth Department of Infrastructure, Transport, Regional Development and Local Government. This is a condition of the funding arrangement of the research grant. The Department may publish the report. Findings may also be published by the research team in academic journals or books, or presented at scholarly gatherings such as conferences, or on online via research-oriented web pages.

Study data and findings will be used only for the purposes of research analysis and subsequent publication. Data will *not* be made publicly available in any way other than for research purposes. For example, data will *not* be made available to the wider broadcast public media. Data may however be made available for viewing-only through the internet via research oriented websites (e.g. the researchers' university pages).

Confidentiality

The study employs a range of measures to ensure your anonymity and confidentiality. The study will *not* keep a record of your name or any identifying personal details. The only personal information to be collected will relate to your eligibility as holder of a current and valid driver's licence, your years of driving experience, and confirmation that you are over 18 years of age.

However, the study data will be video/audio recordings of drivers, and stills made from these recordings. Therefore participants may be identifiable through their image or their voice quality.

On the Consent form participants are asked to choose from a range of possibilities for how their data can be used and for the level of anonymisation required for identifying details in the data.

The study can make use of many techniques commonly used to anonymise video data in published contemporary research of naturally occurring behaviour and interaction. These techniques include blurring visual images, converting photographic stills to line sketches, and even distorting voices.

The confidentiality measures will apply to both drivers and any passengers. Parents will be asked for their consent on behalf of their own children travelling as passengers (under the age of 18).

No personal identifying *information* (e.g. name) will be associated with any data. Data will be analysed only by the study investigators or for other research purposes as agreed to on the consent form. Data will be stored on a computer with password access and in a locked room. The digital camcorder may also store data and so when not in use for data collection will be kept in a locked filing cabinet in a locked room.

Personal information will be kept confidential so far as the law allows. For example in the event that the video record is subpoened, you or the ANU may be required to provide it to a criminal or civil court.

Are there any risks if I participate?

There are no known risks of participating in this study. You will only be asked to consent to having your driving video recorded while you make ordinary driving trips for your own purposes.

There is however believed to be a small increase of risk of break in if a car has a camera fitted in it. For this reason participants will be asked to dismount and hide the camera when

they leave their cars unattended. Failure to take these steps also may (if there is a break in), affect private insurance cover for the vehicle, as insurers may regard the presence of the camera as a relevant matter to be disclosed to them. Again, hiding the camera, will remove any potential risk.

The study is being conducted according to the research ethics protocols of the ANU. If you have concerns regarding the way the research was conducted you can contact the ANU Human Research Ethics Committee, Research Office, Chancelry 10B,Tel: 6125-7945, Email: Human.Ethics.Officer@anu.edu.au

Contact for the study is:

Dr Maurice Nevile, Lecturer, CEDAM, 6125 3199
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CONSENT FORM

Research Study

Investigating ordinary driving activities

Research contacts: Dr Maurice Nevile, Lecturer, CEDAM, 6125 3199, maurice.nevile@anu.edu.au

1. I ……(please print) consent to take part in the study *Investigating ordinary driving activities.* I have read the information sheet for this study and I understand its contents. I have had the nature and purpose of the research study, so far as it affects me, fully explained to my satisfaction by a member of the research team. My consent is freely given. I understand that I have been approached as a possible participant for the study only because I drive a motor vehicle.

2. I am over eighteen years of age.

3. I have a current and valid driver's licence, and I am legally permitted to drive a motor vehicle in the ACT and NSW. I am the primary or sole driver of my car.

4. I understand that my personal information such as my name and any other information which can potentially identify me will be kept confidential so far as the law allows. For example in the event that the video or other record is subpoenaed, I or the ANU may be required to provide it to a criminal or civil court. This form, and any other identifying materials, will be stored in a locked office at the Australian National University and will not be linked to data and analyses for the study.

5. I understand that this study is interested in my ordinary driving activities. The study will video me as I drive just as I normally drive. The study does not ask me to drive or act any differently to my usual driving. I will not be asked about my driving. My driving ability will not be judged.

6. I understand that if I agree to participate in the research study I will be recorded on digital video while I am driving, or while I am a passenger in a motor vehicle. The video recordings, and stills made from them, will be the data to be analysed for the research study. The study will use this data for legitimate research purposes, including analysis and for scholarly publications such as presentations (such as conferences or seminars) and written publications such as in a journal article or book. My name or other information identifying me will not be used. I understand that these apply also to my children who may be travelling with me as passengers.

7. I understand that cameras will be mounted in-car to have no impact on driving activity. When I leave the car at the end of a trip I am asked to dismount the cameras and either remove them or conceal them in the car (e.g. in the boot, or in a green shopping bag). This approach to collecting video data has been conducted in similar overseas road safety studies (e.g. in the UK and France), including in the Finland by the co-investigator of the study. I acknowledge that failure to dismount the camera may increase risk of a break-in to

my vehicle, or may adversely affect my insurance cover in the event of a break-in and acknowledge that the University will not be responsible for any loss to my car or my personal effects in that event. I understand that I will not be responsible for accidental loss or damage to or theft of the camera. I agree to advise ANU immediately if there is a break-in to my car and I believe it is connected with my participation in the project.

8. I understand that, as far as the law allows, the data will not be used or made publicly available other than for research purposes. For example, data will NOT be made available to the wider broadcast public media. Excerpts of data may however be made available through publication on the internet via research oriented websites (e.g. the researcher's university pages). Any data presented online will be anonymised by blurring facial features. Recorded data and analyses will be stored on computers or media (disks) kept in locked and secure premises.

9. *Use of study research data*: I understand that my name will always remain confidential. I understand that my recorded video data for the research study will be used for research purposes only as far as the law allows, such as analysis, scholarly presentations (conferences and seminars) and written scholarly publications (e.g. journals, books).

I understand that I might be identifiable in the study data by my face or other visual identifying features, or by my voice. It is possible for me to choose from among various levels of anonymisation required.

I understand that data can be used 'as is' or 'anonymised' with my visual identifying details obscured - for example by blurring facial features or converting images to line sketches.

(A) PLEASE CIRCLE THE DOT POINT WHICH INDICATES YOUR PERMISSION

I give my permission for my own data to be used for research purposes as indicated below:

EITHER ……

- Unconditionally as is, for ALL research purposes only, INCLUDING all forms of scholarly presentation and publication, including excerpts on research oriented web-pages …. NOW GO TO (B) BELOW

OR …… CIRCLE 'AS IS' OR 'ANONYMISED' FOR THE FOLLOWING OPTIONS

- For scholarly presentations (e.g. conferences, seminars) AS IS / ANONYMISED
- For written research publications (e.g. books, research journal papers) AS IS / ANONYMISED
- As excerpts on research oriented web-pages ANONYMISED

OR ……

- For research analysis but NOT for presentation or publication in any form

(B) PLEASE CIRCLE THE DOT POINT WHICH INDICATES YOUR PERMISSION

I give permission for my data to be shown in presentations for research purposes as indicated below:

- Anywhere
- Not in the ACT but elsewhere is OK
- Not in Australia but overseas is OK

10. *Children as passengers*: I am able and I do give consent for the use of data as indicated by my choices above with respect to my children (under eighteen years of age) who are travelling as passengers in a car which I am driving.

11. *Passengers*: I will ask adult passengers to complete a relevant Consent form for the study.

12. I understand that I may withdraw from the research study at any stage, without providing any reason, and that this will not have any adverse consequences for me. If I withdraw, the information I provide will not be used by the study.

Your signature

Signed ……. Date ……

Researcher to Complete

I …… certify that I have explained the nature and procedures of the research study to …….and consider that she/he understands what is involved.

Signed …….. Date ……..

Centre for Educational Development and Academic Methods
Building 96 Linnaeus Cottage, Linnaeus Way
Australian National University
Canberra ACT 0200 Australia

CONSENT FORM
FOR ADULT PASSENGERS

Research Study
Investigating ordinary driving activities

Research contacts: Dr Maurice Nevile, Lecturer, CEDAM, 6125 3199, maurice.nevile@anu.edu.au

1. I ……(please print) consent to take part in the study *Investigating ordinary driving activities***.** I have read the information sheet for this study and I understand its contents. I have had the nature and purpose of the research study, so far as it affects me, fully explained to my satisfaction by a member of the research team. My consent is freely given.

2. I am over eighteen years of age.

3. I understand that my personal information such as my name and any other information which can potentially identify me will be kept confidential so far as the law allows. For example in the event that the video or other record is subpoenaed, I or the ANU may be required to provide it to a criminal or civil court. This form, and any other identifying materials, will be stored in a locked office at the Australian National University and will not be linked to data and analyses for the study.

4. I understand that this study is interested in ordinary driving activities. I understand that if I agree to participate in the research study I will be recorded on digital video while I am a passenger in a motor vehicle. The video recordings, and stills made from them, will be the data to be analysed for the research study. The study will use this data for legitimate research purposes, including analysis and for scholarly publications such as presentations (such as conferences or seminars) and written publications such as in a journal article or book. My name or other information identifying me will not be used.

5. I understand that, as far as the law allows, the data will not be used or made publicly available other than for research purposes. For example, data will NOT be made available to the wider broadcast public media. Excerpts of data may however be made available through publication on the internet via research oriented websites (e.g. the researcher's university pages). Any data presented online will be anonymised by blurring facial features. Recorded data and analyses will be stored on computers or media (disks) kept in locked and secure premises.

6. *Use of study research data*: I understand that my name will always remain confidential. I understand that my recorded video data for the research study will be used for research purposes only as far as the law allows, such as analysis, scholarly presentations (conferences and seminars) and written scholarly publications (e.g. journals, books).

I understand that I might be identifiable in the study data by my face or other visual identifying features, or by my voice. It is possible for me to choose from among various levels of anonymisation required.

I understand that data can be used 'as is' or 'anonymised' with my visual identifying details obscured - for example by blurring facial features or converting images to line sketches.

(B) PLEASE CIRCLE THE DOT POINT WHICH INDICATES YOUR PERMISSION

I give my permission for my own data to be used for research purposes as indicated below:

EITHER ……

- Unconditionally as is, for ALL research purposes only, INCLUDING all forms of scholarly presentation and publication, including excerpts on research oriented web-pages …. NOW GO TO (B) BELOW

OR …… CIRCLE 'AS IS' OR 'ANONYMISED' FOR THE FOLLOWING OPTIONS

- For scholarly presentations (e.g. conferences, seminars) AS IS / ANONYMISED
- For written research publications (e.g. books, research journal papers) AS IS / ANONYMISED
- As excerpts on research oriented web-pages ANONYMISED

OR ……

- For research analysis but NOT for presentation or publication in any form

(B) PLEASE CIRCLE THE DOT POINT WHICH INDICATES YOUR PERMISSION

I give permission for my data to be shown in presentations for research purposes as indicated below:

- Anywhere
- Not in the ACT but elsewhere is OK
- Not in Australia but overseas is OK

7. I understand that I may withdraw from the research study at any stage, without providing any reason, and that this will not have any adverse consequences for me. If I withdraw, the information I provide will not be used by the study.

Your signature

Signed ……. Date ……

Researcher to Complete

I …… certify that I have explained the nature and procedures of the research study to …….and consider that she/he understands what is involved.

Signed …….. Date ……..

Debriefing sheet

Centre for Educational Development and Academic Development
Building 96 Linneaus Cottage, Linneaus Way
Australian National University
Canberra ACT 0200 Australia

Dr Maurice Nevile

Research Study

Investigating ordinary driving activities

DEBRIEFING SHEET: AFTER DATA COLLECTION

General aim of the study

You have participated in the research study '*Investigating ordinary driving activities'*. The study is conducted at the Australian National University and funded as a Road Safety Research Grant awarded by the Commonwealth Department of Infrastructure, Transport, Regional Development and Local Government (2008–2009). An intended outcome of the study is to inform public awareness and road safety campaigns, and so potentially improve road safety.

You have allowed the investigators to video record you while you were driving your car in ordinary ways and for authentic trips you would normally make.

When you agreed to participate you were given an Information sheet and signed a Consent form. The Information Sheet informed you that the research study was investigating people's ordinary driving activities, and was interested in better understanding what driving actually involves in present day conditions. Research and experience has shown that drivers are an important part of a safe road system. The study is innovative internationally because it is one of few studies to consider the details of how people *actually* drive, rather than to rely on drivers' reports or opinions of how they drive.

You were informed of a range of methods employed by the study to ensure your *confidentiality and anonymity*, and you agreed to permit particular uses of your data for research purposes.

A specific focus

This *Debriefing Sheet* informs you of a more specific focus for the study. The *Debriefing*

Sheet asks you to consider this focus before giving final permission to allow your data to be used.

The study focuses on *in-car distractions*. Distractions include mobile phones, entertainment systems, interaction with passengers, and most recently satellite navigation systems. Driver distraction is an important issue for road safety. Australian and international studies have shown that drivers commonly engage in distracting activities while driving, and that distraction is a contributing factor in up to 30% of crashes.

This study seeks to understand better the nature of in-car distractions and their impact on driving, as distractions occur in real-time and in real-world driving situations.

Permission to use data

Please circle the option to indicate your permission to use your data for the study, and then sign the form.

- I give my permission for my recorded data to be used for research purposes *as I have previously indicated* on the study Consent form.

- I give permission for my recorded data to be used for research purposes *as follows*:

		Circle preferred option
1.	For scholarly presentations (e.g. conferences, seminars)	AS IS / ANONYMISED
2.	For written research publications (e.g. books, research journal papers)	AS IS / ANONYMISED
3.	As excerpts on research oriented web-pages	AS IS / ANONYMISED

- I give permission for my recorded data to be used for research analysis but *not* for presentation or publication in any form

- I do not give permission for my recorded data to be used for the study.
  I withdraw my participation in the study.

Your name and signature

Name…….(please print)

Signed ……. …….Date ……

The study is being conducted according to the research ethics protocols of the ANU. If you

have concerns regarding the way the research was conducted you can contact the ANU Human Research Ethics Committee, Research Office, Chancelry 10B,Tel: 6125-7945, Email: Human.Ethics.Officer@anu.edu.au

Contact for the study is:

Dr Maurice Nevile, Lecturer, CEDAM, 6125 3199, maurice.nevile@anu.edu.au