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Audio on the go: The effect of audio cues on memory in driving

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ABSTRACT

An inability to recall details from an otherwise uneventful drive on a familiar route is a common experience to many. Whether this amnesia for everyday driving is because we don't actually form strong memories when we are driving on autopilot or whether this is because we simply can't find those memories when we try to later is an interesting question, not only for driving, but for memory and skilled performance more generally. The present study sought to determine whether recall could be aided by reinstating an auditory cue that was present during the drive. Twenty-five participants drove three 9 km routes on familiar roads and then were asked a series of questions about the details of the drives. Three auditory cues (music, radio documentary, or periodic verbal markers) and a visual cue were used as contextual stimuli during the drives and as post-drive recall cues. The music and verbal markers produced better recall than the radio documentary. Although proceduralised driving on a familiar road may make incidental details of the drive difficult to recall, those details are recoverable with a sufficiently robust recall cue.

1. Introduction

As drivers, we often find that our everyday driving to and from work and home becomes so familiar that we can make these trips with little conscious attention. It is not uncommon for drivers to have the sense that they have little recollection of the past few minutes of driving and that they have been driving for some distance without paying attention. This phenomenon has been called driving without attention (Kerr, 1991), driving without awareness (Charlton and Starkey, 2011), or more colloquially, driving on autopilot. In spite of being a commonplace experience, there has been relatively little published research on these time gaps in our experience of driving (Chapman et al., 1999; Charlton and Starkey, 2013).

The feeling of returning from autopilot is not unique to driving, it is in evidence in many skilled behaviours that are overlearned or well-practiced, ranging from walking to washing dishes (Groeger, 2000). It has been suggested that this is a consequence of automaticity or proceduralisation and results from the formation of schemata that can guide moment-to-moment performance in familiar situations at an implicit or preconscious level (Groeger, 2000; Norman and Shallice, 1980).

With extended practice, attention to a primary task need not be continuous in order for task performance to carry on, as recent studies of mind wandering while driving have demonstrated (Burdett et al., 2018, 2019). One noteworthy consequence of driving without awareness, however, is the increased incidence of inattentional blindness and change blindness for many aspects of the driving situation, including changes to road signs and buildings (Charlton and Starkey, 2013; Harms and Brookhuis, 2016; Martens and Fox, 2007). To what extent this absence of attention affects the formation of memory in everyday driving is still an open question.

Relatively few studies have examined the extent and accuracy of our memory for driving. In one experiment, participants rated danger and driving difficulty while driving a fixed route (Groeger et al., 2000). After the drive, the participants were asked to recall as much as they could about what had happened at six locations (intersections) during the drive. Participants were able to correctly recall whether they had stopped at the intersection and whether there was a car ahead of them, but other details of the situation such as the presence of pedestrians, cyclists, or parked cars were not recalled. In another experiment participants were shown a series of short video scenes depicting the view through a car windscreen as it proceeded through intersections (Groeger, 2000; Chapman and Groeger, 2004). This was followed by a larger block of video scenes and the participants were asked to indicate which of the scenes they recognised from the first block. In general, the participants' recognition accuracy was rather poor (ranging from 66% - 72% correct). Similarly, participants who "drove" a series of video scenes of familiar rural roads in a driving simulator and were then shown a series of photographs and asked to identify whether they recognised any of them from the video scenes displayed similar levels of recognition accuracy, an average of 70.41% (Charlton et al., 2014). In another experiment, drivers' recall of details from drives on familiar urban roads were tested following either on-road drives or a video based drive of the same road in a driving simulator (Charlton and Starkey, 2018). Participants' recall accuracy for the presence and position of

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other road users at specific locations was only 66.0 to 68.6% correct. Recall of whether they had stopped at the location was somewhat better at 75.7%, regardless of whether they had driven on-road or in the simulator. In the above studies, the recall and recognition cues were often photographs of locations from the videos or on-road drives.

Whether this amnesia for everyday driving is because we don't actually form strong memories when we are driving on autopilot or whether this is because we simply can't find those memories when we try to later is an interesting question, not only for driving, but for memory and skilled performance more generally. An interesting question to ask in this regard is whether recall accuracy in these tests would be aided by a better retrieval cue, such as one that reinstated some of the driving context.

Listening to music or the radio has been found to be the most common activity drivers engage in as they drive, with many drivers reporting listening to music habitually (Dibben and Williamson, 2007; North et al., 2004). The effect of radio and music listening on driving performance has been the subject of mixed findings, but in general little or no driving impairment has been found (Cassidy and MacDonald, 2010; ünal et al., 2013). As a dynamic but continuously present contextual stimulus, audio from the radio during a drive would appear to be a promising retrieval cue for drivers' recall of events from an everyday drive. While the benefits of context reinstatement are well-documented for recall of explicit episodic stimuli (e.g., word lists or actors in a staged crime) their effectiveness for incidental memories such as details of a recent drive has not been established (Godden and Baddeley, 1975; Krafka and Penrod, 1985; Thompson et al., 2001).

The present study was motivated by the question of whether drivers' experience of amnesia for everyday driving is simply the consequence of an inability to retrieve the information or deficiency in memory formation in the absence of explicit attention to the driving task. More specifically, we asked whether drivers' recall accuracy could be improved by using an auditory recall cue that partially reinstated the context of the drive. We compared three types of auditory cue and a visual cue by asking drivers to take three short drives on familiar roads while listening to music, a radio documentary, or audio "markers" announcing 'Location 1, 2, etc.' every 2 min. Music was chosen by virtue of its dynamically changing content and prevalence of use by drivers. This was compared to a radio documentary, which was also continuously present and dynamically changing, but without the rhythmic and aural properties of music. The audio markers were used to provide periodic (i.e., non-continuous) auditory points of reference during the drive as a comparison. Of interest was which of these stimuli, when used as recall cues, would be associated with the best recall accuracy when compared to our fourth and final recall cue, a still photograph from the drive.

2. Method

2.1. Participants

Twenty five licenced drivers (13 male) were recruited to take part in the study. Their ages ranged from 17 to 61 years ($M = 32.2$, $SD = 13.95$) with an average number of years of driving experience of 13.48 ($SD = 12.43$) and a reported average of 4.78 ($SD = 2.92$) hours of driving per week. The participants were recruited for the study via posters placed in noticeboards in the community and electronically via social media and the Transport Research Group's communication channels. Participation was not limited or stratified by any demographic characteristics, the only requirement was that participants have a current New Zealand driver's license and access to a car that they could use for the study. The recruitment protocol was approved by a University ethics review board, and in previous studies we have found that this protocol has resulted in samples that are representative of the wider driving population. Each participant provided informed consent and was offered a $20 NZD gift voucher as an expression of thanks for volunteering their time and car.

2.2. Apparatus

Participants used their own cars and a video recorder was temporarily mounted between the front headrests to collect a video record of the drive from the driver's perspective. A tablet computer was placed on the passenger seat with a pair of portable speakers to play audio stimuli during the drives. Audio stimuli were controlled and normalised at approximately 60dBA (using the tablet's 'smart volume' function) as per recommendations for comfortable listening (Cassidy and MacDonald, 2009).

2.3. Materials

Three driving routes around the university area, each approximately 9 km long, were identified by the researchers. Each route took approximately 15 min to drive and was composed of predominantly residential roads with 50 km/h speed limits and equivalent amounts of traffic. Prior to each participant, the auditory conditions were randomly assigned to the routes, and the order that the auditory conditions were driven was counterbalanced across participants. The auditory conditions were 1) Music, 2) Radio, and 3) Marker.

For the Music condition participants were asked to create a 20 min playlist from a pre-constructed list of twenty songs of various genres with an average song length of 2.93 min. Of the twenty songs, six were slow tempo (Range: 50-85 bpm), seven mid-tempo (Range: 90-105 bpm) and seven fast tempo (Range: 110 + bpm). Any songs that possessed lyrics were in English, and all songs were drawn from popular charts found on song sharing websites.

For the Radio condition participants were asked to choose one radio documentary from a list of three public radio podcasts. In order to ensure topics were relevant, podcasts on the list all had broadcast dates within the past 6 months (at the start of the experiment). The Marker condition involved a pre-recorded voice noting "Location 1", "Location 2", "Location 3" etc., approximately every 2 min, with "Location 10" at the 20th minute being the final marker.

A series of post-drive recall questions were presented verbally to each participant in conjunction with recall stimuli from the immediately preceding drive. Recall cues for the Music condition consisted of 10 s segments of three of the songs on the participant's playlist. Segments were selected such that they occurred at least 2 min apart on the participant's playlist. For the Radio condition three 10 s segments from the radio documentary chosen by the participant were selected, again occurring at least 2 min apart in the documentary. For the Marker condition, three of the audio markers were used.

The first recall question consisted of the researcher playing a 10 s audio cue (or audio marker) and asking "*Do you remember where you were when you heard this?*" If the participant was able to provide a location they were then asked to describe the situation details: "*Can you describe the location, e.g., were there any road signs, other cars, or pedestrians at that spot?*" The second and third recall questions repeated the above for two other points from the drive. For a fourth recall question the participant was shown a still photograph from a location near midway on the drive and asked "*Do you remember what you heard when you were at this location (what song was playing, what was being said, or the most recent verbal statement)?*" The fifth and final recall question asked "*Did anything unusual or unexpected happen during your drive?*" If the answer was yes participants were asked whether they could recall what they were listening to at that point.

In addition to the five recall questions, a short 8-item written questionnaire was prepared based on questions used by previous researchers (Cassidy and MacDonald, 2009; Brodsky and Kizner, 2012). The questions asked respondents to rate levels of drive enjoyment, appropriateness of audio for the driving task, audio enjoyment, attention demand, feeling at ease, and perceived improvement in driving ability, each on an 11-point scale (0 = not at all, 5 = moderately, 10 = highly).

2.4. Procedure

Participants who expressed interest in the study contacted the researchers either through email or mobile phone to schedule an experimental session. Sessions were scheduled such that they avoided hours of peak traffic and bad weather conditions. Prior to the session, participants were sent a map and written directions describing the routes they would be asked to drive. When participants arrived for their session they were briefed on the procedure, signed an informed consent form, and provided brief demographic information (gender, age, years of license, and average distance driven weekly).

Participants were informed that they would be given a series of questions upon their return, however the memory-based nature of the questions was not explicitly emphasized. Following their first drive, some participants may have begun to anticipate questions, and due to this we counterbalanced the implementation of stimuli throughout the experiment.

After the participants chose their music playlist (for the Music condition), or their radio documentary (for the Radio condition) the researcher prepared their selected audio for the drive using the tablet's playlist feature. Participants were then asked to confirm that they knew where they were required to drive, and that they were familiar and comfortable with the route. Participants were accompanied to their vehicles (parked outside the laboratory) where the tablet and video recording apparatus were installed. Participants were reminded to drive as they usually would and then set out on their drive unaccompanied.

At the end of each drive, participants returned to the laboratory and were asked to complete the written (8 item) questionnaire regarding their experience of the drive. Upon completion of the questionnaire the five recall questions were asked verbally by the researcher accompanied by the appropriate audio and photograph cues. This process was repeated for all remaining drives and conditions. Each post-drive interview was audio recorded for later transcription of the answers.

2.5. Data analysis

Participants' responses to the recall questions were scored as correct or incorrect by comparing them to the video recordings of their drives. Responses were coded as correct, incorrect, or did not recall ("don't know"). A percent recall accuracy score was calculated for each participant across the 3 audio cue locations. Error scores were also calculated as the percent incorrect location and percent don't know by averaging across all three questions for each participant. For the photo cue, an overall recall accuracy measure was calculated as the average recall accuracy across the three drives.

Similarly, recall accuracy for situation details was scored as 1 or 0 and a percent correct across the 3 locations in each condition was calculated for each participant. As above, error types were scored as percent incorrect situation and percent don't know (Situation detail scores were not applicable for the photo recall question.)

To compare recall accuracy across the three audio cue types, and the photo recall cue, a repeated measures ANOVA was conducted. Bonferroni-adjusted pairwise comparisons were conducted for the individual comparisons between cue types. A repeated measures ANOVA was also used to compare the three audio cues for the participants' situation details scores, with Bonferroni-adjusted pairwise comparisons as above.

A series of repeated measures ANOVAs was used to assess the differences between the three audio cue types as regards the participants' ratings of drive enjoyment, auditory appropriateness, awareness of audio, audio distraction, enjoyment of audio, feeling at ease, and improved driving. Finally, bivariate correlations (Pearson's r) were calculated to assess the relationship between participants' recall accuracy and their age, average hours of driving per week, and total years spent driving.

3. Results

3.1. Location recall accuracy

The participants' recall accuracy in each cue condition is shown in Fig. 1. For the Photo cues, the percentage of correctly recalled answers for each target type (Music, Radio, or Marker stimulus) is also shown. As can be seen, the Music cues were associated with the highest recall accuracy (M = 81.34% accuracy) and the Radio condition had the lowest (M = 33.34% accuracy). The figure shows that overall recall accuracy for the Photo cues (60.00%) was better than the Radio cues, and approximately the same as the Marker condition (65.17%). Participants' recall of what they heard at a particular location when given a Photo cue depended on what they were listening to during the drive. The figure shows that participants' recall of what they were listening to was lowest for the Radio documentary (13.33% accuracy).

The repeated measures ANOVA comparing recall accuracy for the four cue conditions indicated that the difference between the recall cue types was reliable ($F(3,72) = 8.23$, $p < .001$, $\eta_p^2 = 0.330$). Post hoc pairwise comparisons indicated that the recall accuracy for Music was significantly higher than Radio ($p < .001$) and Photo ($p = .030$) but not the Marker condition ($p = .240$). The location recall accuracy for Radio cues were significantly lower than Marker ($p = .022$) and Photo cues ($p = .012$). None of the other pairwise comparisons met the Bonferroni-adjusted criterion for reliable differences.

Fig. 2 shows the participants' error scores for the four cue types. The top panel of the figure contains the percent of incorrect location answers for the three auditory cues and the percent incorrect audio answers for the photo cues. The lower panel of the figure displays the same information for the participants' don't know responses, cases where they were unable to provide any answer to the recall questions. As can be seen, the Music cue condition was associated with the lowest rate of incorrect locations (M = 13.33%), with Radio, Marker, and Photo cues having similar numbers of incorrect responses (M = 34.66, 30.29, and 23.99 respectively). A repeated measures ANOVA indicated that the difference in incorrect responses across the four cue types was reliable ($F(3,72) = 2.81$, $p = .045$, $\eta_p^2 = 0.105$), but the post hoc pairwise comparisons did not meet the Bonferroni-adjusted criterion, the difference between Music and Radio cues was the closest to this threshold at $p = .062$.

The lower panel of the figure shows that the Radio cue was associated with the highest rate of don't know responses (M = 32.00%) followed by the photo cue (M = 15.99), and the difference between the four conditions was statistically reliable for this measure ($F(3,72) = 11.58$, $p < .001$, $\eta_p^2 = 0.326$). Post hoc pair wise comparisons produced Bonferroni-adjusted mean differences between the Radio cue and the Music and Marker cue types ($p = .002$), but was not reliably higher than the Photo cue ($p = 091$).

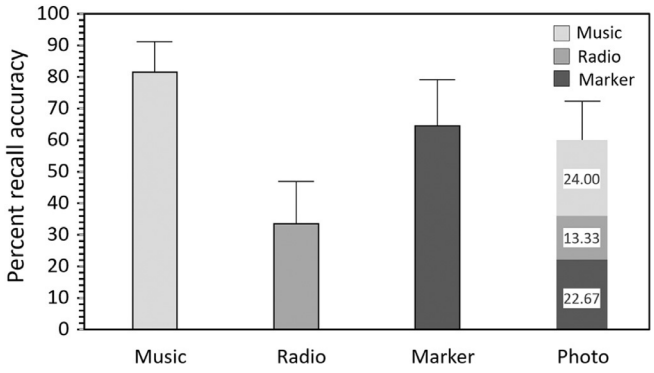

Fig. 1. The participants' mean recall accuracy of location when given music, radio, or marker cues, and participants' mean recall accuracy of audio when given photo cue for a location. Error bars show 95% confidence intervals.

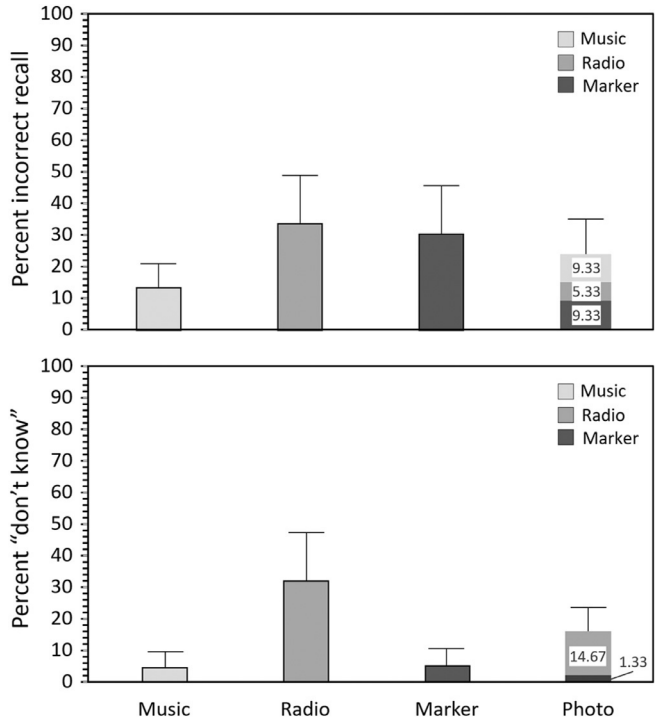

Fig. 2. Participants' error scores for the four cue types. The top panel shows the percent of incorrect location answers for the three auditory cues and the percent incorrect audio answers for the photo cues. The lower panel of the figure displays the same information for the participants' "don't know" responses. Error bars show 95% confidence intervals.

3.2. Situation recall accuracy

Fig. 3 shows the participants' recall of the situation details at each location in response to the three types of audio cues (the situation question was not asked for the Photo cue). The left panel shows the accuracy of situation details recalled, the middle panel shows the percent of incorrect responses for each cue type, and the right panel shows the percent of don't know responses for each cue type. A repeated measures ANOVA for the situation recall accuracy measure revealed a significant difference between the three cue conditions ($F(2,48) = 10.77$, $p < .001$, $\eta_p^2 = 0.310$). Bonferroni-adjusted pairwise comparisons indicated that the Music condition was significantly different ($p = .001$) from the Radio condition, but Marker cues did not meet the Bonferroni-adjusted threshold when compared to either Music or Radio ($p = .055$).

The error analysis of situation responses showed a strikingly similar pattern to the location responses. A repeated measures ANOVA comparing the percentages of incorrect situation responses for the three listening conditions indicated that there was a reliable difference ($F(2,48) = 3.89$, $p = .027$, $\eta_p^2 = 0.140$), and post hoc comparison showed that this was the result of the Music condition (M = 15.99%) being lower than the other two conditions ($p = .001$). Analysis of don't know answers indicated a significant cue type difference ($F(2,48) = 8.43$, $p = .001$, $\eta_p^2 = 0.260$). Bonferroni-adjusted pairwise comparisons indicated that the rate of don't know responses to the Radio cue ($M = 40.00\%$) was significantly higher than the other conditions ($p = .031$ or better).

3.3. Unusual events, demographics, and ratings

Only three participants answered the fifth recall question indicating that something unusual or unexpected had happened during the drive, too few for meaningful analysis. Bivariate analysis of recall accuracy and demographic measures revealed a significant positive correlation between average hours driven per week and location recall accuracy for the Music condition ($r(24) = 0.406$, $p < .05$) and between situation recall accuracy for the Music cue and participant age ($r(24) = 0.419$, $p < .05$). Similarly, a significant correlation between years of driving experience and situation recall accuracy was revealed for the Marker condition ($r(24) = 0.388$, $p < .05$). No other significant correlations were observed.

Table 1 shows the participants' ratings of eight aspects of each drive. Participants clearly had preferences for driving while listening to the music playlist as compared to the radio documentary. There were significant differences between the three audio conditions for all the questions with the exception of "attention demand" and "improved driving ability". The Music condition was rated significantly more positively than either Radio or Marker for appropriateness ($p = .014$ or less), distraction ($p = .038$ or less), enjoyment of the audio ($p < .001$), and feeling at ease ($p = .005$ or less), significantly higher than Marker for enjoyment of the drive ($p = .012$), and significantly higher than Radio for awareness of the audio ($p = .001$).

No statistically reliable differences due to participant gender, age, years of driving experience, or hours driven per week were identified in any of the measures.

4. Discussion

One would think that explicit memory for recent trips would be important for driving safety and efficiency. However, drivers fail to recall many aspects of an everyday trip once they have reached the end of the journey (Chapman and Groeger, 2004; Charlton et al., 2014; Charlton and Starkey, 2018). One possible explanation for this recall failure is that performance of highly proceduralised tasks (such as driving on a familiar road in one's own car) does not require explicit attention, and as a result memory traces are not formed and not available for subsequent retrieval. Alternatively, the details of a proceduralised trip may be available to drivers at an implicit level, and even made explicitly accessible in the presence of a strong recall or recognition cue.

The findings of the present study support the second of these two interpretations, memories for an everyday driving trip were available

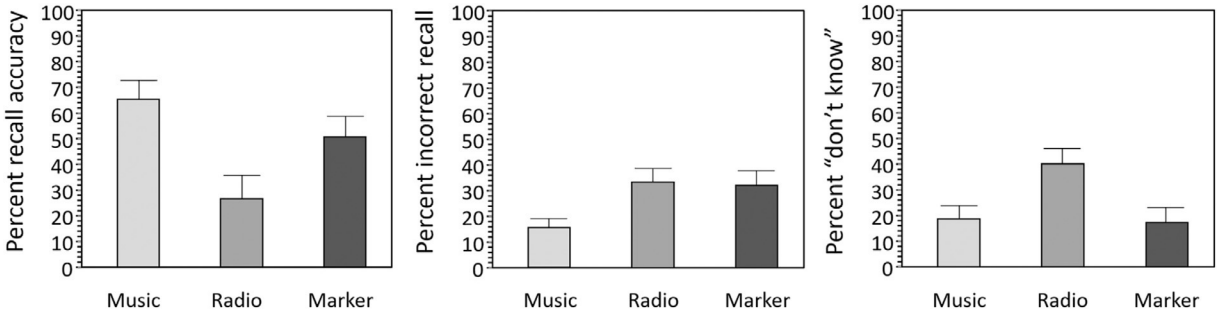

Fig. 3. Participants' situation detail recall for the three auditory cues. Percent recall accuracy (left panel), percent incorrect responses (middle), and percent "don't know" responses (right panel). Error bars show 95% confidence intervals.

Table 1
Participants' ratings of eight aspects of driving for each of the three audio conditions. Shown are the mean ratings for each condition and the results of repeated measures ANOVAs for each measure.

	Music	Radio	Marker	$F(2,48)$	η_p^2
	M	*M*	*M*		
Enjoyed drive	7.40	6.52	5.76	7.03*	0.227
Appropriateness	7.36	5.20	5.84	9.73**	0.288
Awareness of audio	7.80*	5.72	6.88	6.10*	0.203
Distraction	3.71	3.79	1.79	6.67*	0.225
Enjoyed audio	8.38	5.33	3.88	33.01**	0.589
Attention demand	5.08	5.00	4.04	1.29	0.051
Feel at ease	7.00	4.92	4.28	11.69**	0.328
Improved ability	4.27	3.00	3.40	1.99	0.077

* $p < .01$.
** $p < .001$.

for recall, and accessible with a good recall cue. In the present experiment, the Music cue was effective in aiding participants to recall their location and situation details at various points of the drive. The accuracy of their recall with a Music cue was in stark contrast to their accuracy when given a verbal cue from a radio documentary, or even a visual cue from a photograph.

The surprisingly low levels of recall accuracy and high rate of don't know responses resulting from the verbal radio documentary cues fuels the question of why they were so ineffective. One of the possible reasons is that the documentary material lent itself to processing for the gist of the material, rather than the surface characteristics (Bransford et al., 1972; Kintsch, 1994), and as such, excerpts were not effective recall cues for the details of what happened at particular points during the drive. Another reason could be that the documentary information was simply not attended to by the participants. The participants' ratings of their awareness of the radio documentary was significantly lower than their ratings for music, although the attentional demand required for the documentary and the music was approximately the same. Further, although participants were free to choose the documentary topic (from a list of three), the participants ratings showed that it clearly did not afford the same level of enjoyment as the music playlist. The lack of engagement with the documentary as a reason for the poor performance is also supported by the participants' inability to recall what part of the documentary they were listening to when given a photo of a particular location as a cue.

When participants were given photographs of particular locations as recall cues, their recall of what they were listening to was fairly poor overall (60%), but especially for the radio documentary. These findings are similar to the recognition performance for driving scenes reported in previous studies (Chapman and Groeger, 2004; Charlton et al., 2014). Why then were the music excerpts so effective as recall cues? As suggested at the outset, music may provide important contextual information to aid in the retrieval of the events from the drive. This context was certainly imbued in the auditory properties of the music, but the music cues may have also reinstated mood and emotional characteristics as context, previously shown to have substantial memory effects (Balch and Lewis, 1996; Thaut and Shannon, 1993). Certainly the participants rated their enjoyment of the music, and of the drive generally as greater than the other audio conditions. It is even possible, as some have suggested, that the presence of self-selected music during the drive may have become integrated with, and optimised performance on the driving task (Cassidy and MacDonald, 2009). Many of our participants shared their accounts with the music stimulus – one such account from participant 4 surmised our findings; "If I needed to focus on the road it [the radio documentary] completely faded out. Music doesn't do that. It seems with music we're listening to this rhythm, this beat, there's constant things changing that keeps our attention on it, but conversation. . .we can ignore it."

A final question to ask is why the audio markers performed as well as they did. During the drive they occurred only periodically, and thus could not provide a continuous auditory context in the same way as the music playlist did. Further, the drivers did not rate the markers as enjoyable, or as improving their enjoyment of the drive. They did however, rate their awareness of the audio markers as somewhat higher than the radio documentary. We believe that the periodicity of the markers may have lent them an alerting role. When the participants heard a marker announce a location, it served to highlight the current driving situation to drivers. No matter what they had been thinking about previously, the drivers now focussed on the drive and where they were. As a result, drivers intentionally or unintentionally processed the driving elements somewhat differently in the presence of the markers, making these locations distinctive and more readily recalled when the marker was used as a cue.

It has been suggested that perceived risk should make events from a drive more memorable (Chapman and Groeger, 2004), previous research by us and others has shown that there is not always a clear relationship between perceived risk or difficulty, and memory for events at those locations (Chapman and Groeger, 2004; Charlton and Starkey, 2018). In the present experiment we explicitly chose a familiar driving route that minimised both driving risk and driving difficulty (for reasons of participant safety) and thus our findings do not help resolve that puzzle. We also limited the variety of music the participants could experience during the drive. We constrained the music choices of the participants so that we could make meaningful comparisons of the different types of retrieval cue. As a result, however, we cannot say whether the same results would be obtained for unfamiliar routes, difficult or risky driving experiences, or even all types of music. Related to this, some researchers have reported that that some types of music may have direct effects on driver speeds (Brodsky, 2001). The relationship between these aspects and driver memory, performance, and safety will require further investigation, either with recordings of naturalistic driving or from the safety of a driving simulator.

In conclusion, this initial study provides a good indication that memories for proceduralised performance of a skilled task, such as everyday driving, are available for subsequent recall. Even though drivers' recall of the events from an ordinary drive is generally poor it doesn't mean that those events are not processed and stored in memory. We believe this is important because it begins to explain how this information can add to a driver's experience and skill, even without being explicitly considered or rehearsed after a drive. It also suggests that music provides a good contextual cue that can be used in future research to aid retrieval and examine implicit processing and memory for skilled actions such as driving.

At an even more practical level, we found that listening to a radio documentary was a poor recall cue, and our participants indicated that it required the greatest amount of driver attention. Therefore, listening to narrative prose such as a documentary is potentially a greater distraction to drivers than listening to music. Although listening to radio documentaries or audiobooks is a relatively common activity, it is not typically identified as a potential distractor alongside use of mobile phones, eating and drinking, adjusting air conditioning or entertainment controls, or interactions with passengers. Given just how commonplace these activities are during everyday driving, the present experiment may set the stage for further research into the potential risks associated with them, as well as motivate closer examination into the mechanisms underlying everyday driving and our inability to readily recall events after completion of a drive, an experience shared by many.

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