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Driver Behaviour and Task-Sharing Strategies When Using a Portable Music Player

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Background

- Use of portable digital music players (e.g. iPods) by drivers is becoming increasingly popular
 - 41% of Victorian drivers who own a portable music player reported using it while driving (Young & Lenné, 2010)
- Operation of these systems requires a high level of visual demand and navigating complex menu structures; thus, the potential for driver distraction is high
 - Degraded lane-keeping performance, and increased speed variability, perceptual response time to critical events and the number and duration of glances inside the vehicle (Chisholm et al., 2008; Salvucci et al., 2007)

Background

- Research into portable music devices is in its infancy
- We know little about:
 - the effect of interacting with music players that feature ‘touch’ interfaces, which provide no tactile feedback to the user
 - the extent to which interaction with these devices can be interrupted/resumed and, thus, shared with the driving task
 - whether the effects of these devices differ across driver groups

Aims

- Primary aim was to examine the effects on driving performance and task-sharing strategies, of performing music selection tasks on a touch screen portable digital music player (iPod Touch™)
- A secondary aim was to examine whether the effects of the music selection tasks and task sharing strategies differs across young vs. middle-aged drivers
 - Young drivers are more willing to engage in secondary tasks and are more vulnerable to their negative effects, but
 - They may have more experience using portable music devices

Method

Music Selection Task

- Select target song by scrolling the song list using up/down finger flicks on the touch screen
- Song presentation and interruptions controlled by laptop
- Four music task conditions:
 - **Short with Interruption:** Search for target song positioned within first 250 songs in the list (of 860 songs). Involved 10 sec system-initiated interruption, which took place 5 to 7 sec into the task (randomised across tasks). Participants instructed by the software to restart task
 - **Long with Interruption:** Same as Short with Interruption but target song positioned in last 250 songs in list
 - **Short, no Interruption:** Search through first 250 songs in list, with no interruption
 - **Long, no Interruption:** Same as Long, no Interruption short, but target song positioned in last 250 songs in list
- Each condition was completed during a single drive

Method

Driving Task

- MUARC PC-based Driver Distraction Test
- 6.6km urban driving environment
- 4 speed zones
- Driver required to maintain speed and position on the road using standard vehicle controls
- Expected (traffic light changes) and unexpected (pedestrian stepping out) events
- Drivers' eye glance behaviour was tracked using FaceLab version 4.0



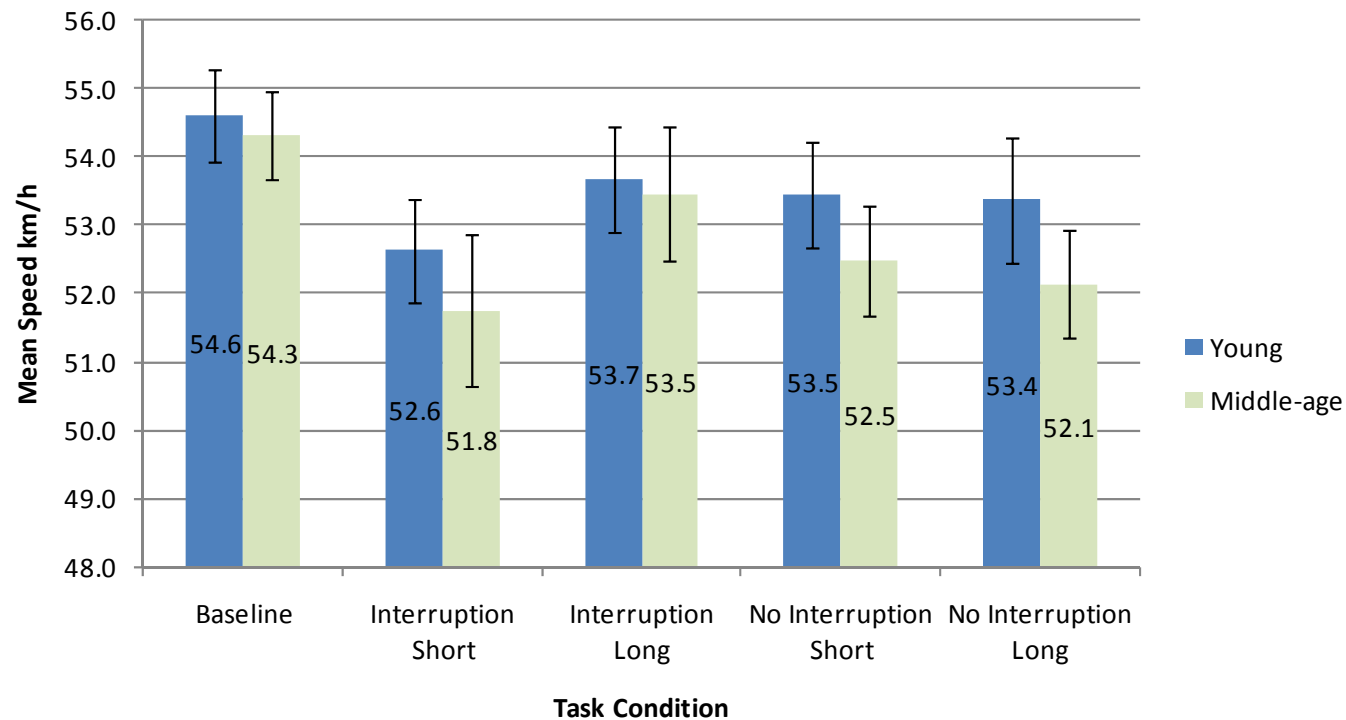
Method

	Young Drivers (18-25yrs)	Middle-aged Drivers (26+yrs)
n	19	18
Mean (SD) Age	20.21 (1.27)	35.56 (6.98)
Gender	10 Males 7 Females	9 Males 11 Females
Licence Type	6 Probationary 13 Full	18 Full
Driving Experience (years)	2.1 (1.5)	16.2 (7.2)
Music Player Experience (hr/w)	6.9 (8.4)	5.0 (5.5)

Results – Driving Performance

Mean Speed

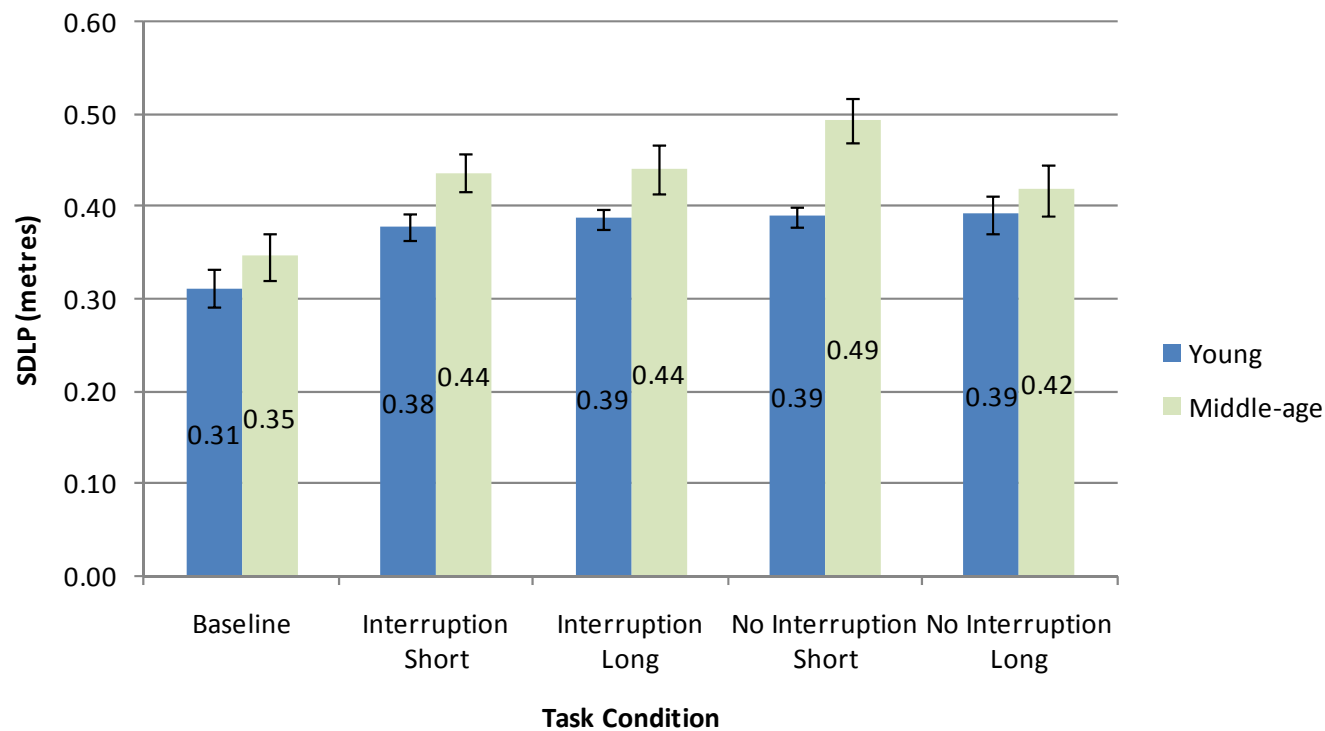
- Mean speed differed significantly across music task conditions



Results – Driving Performance

SDLP

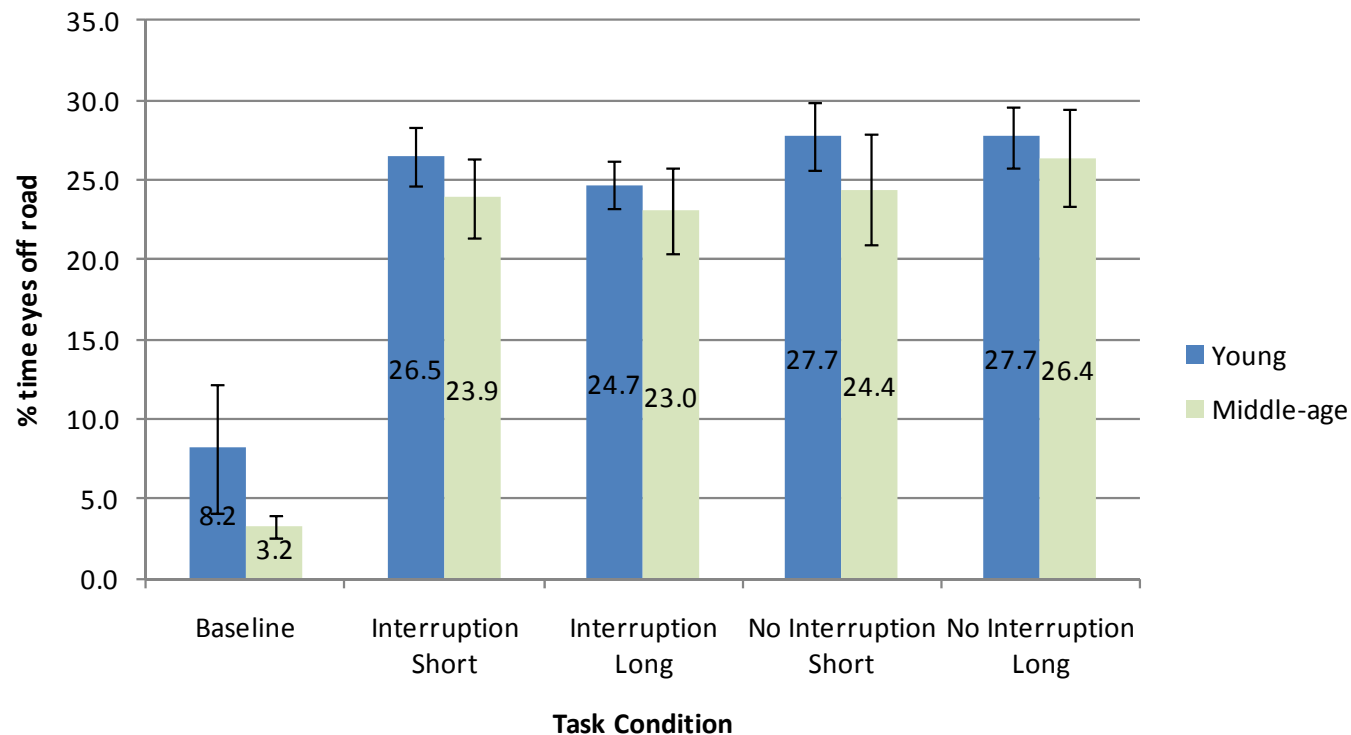
- SDLP differed significantly across driver group & music task conditions



Results – Eye Glance Behaviour

Percentage of Time with Eyes off Road

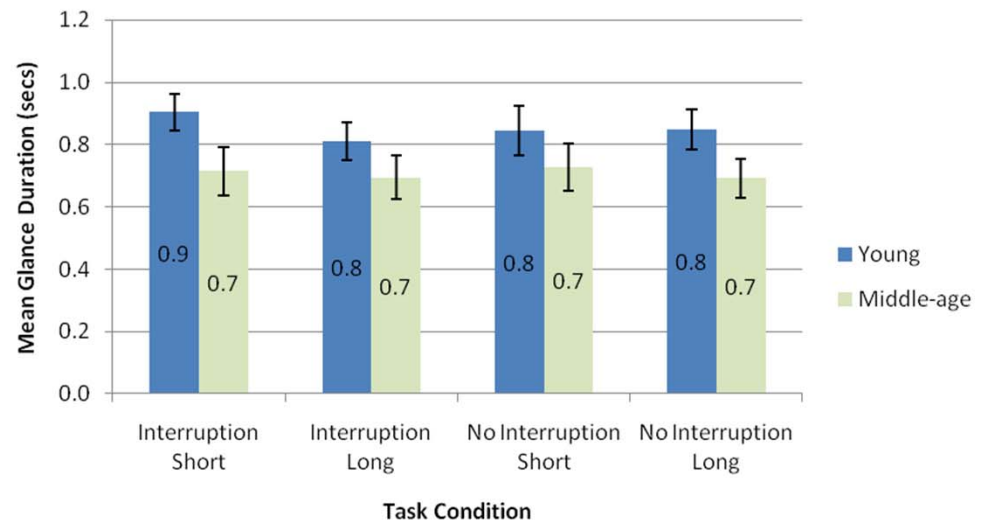
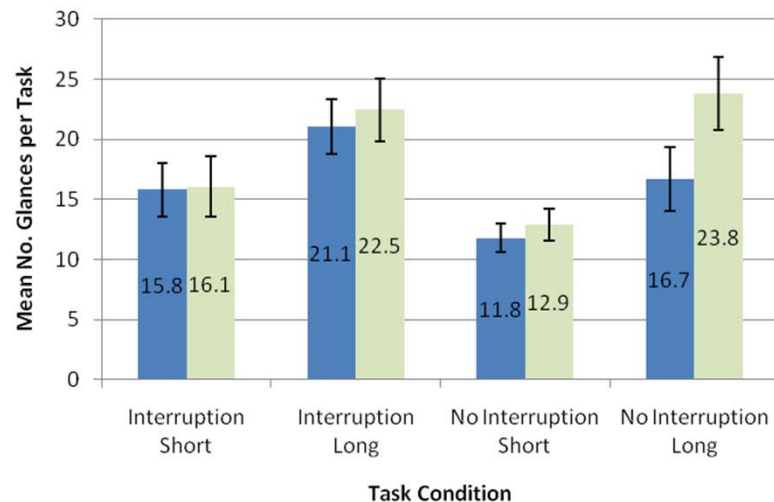
- Differed significantly across music task conditions



Results – Eye Glance Behaviour

Mean Number of Glances and Glance Duration

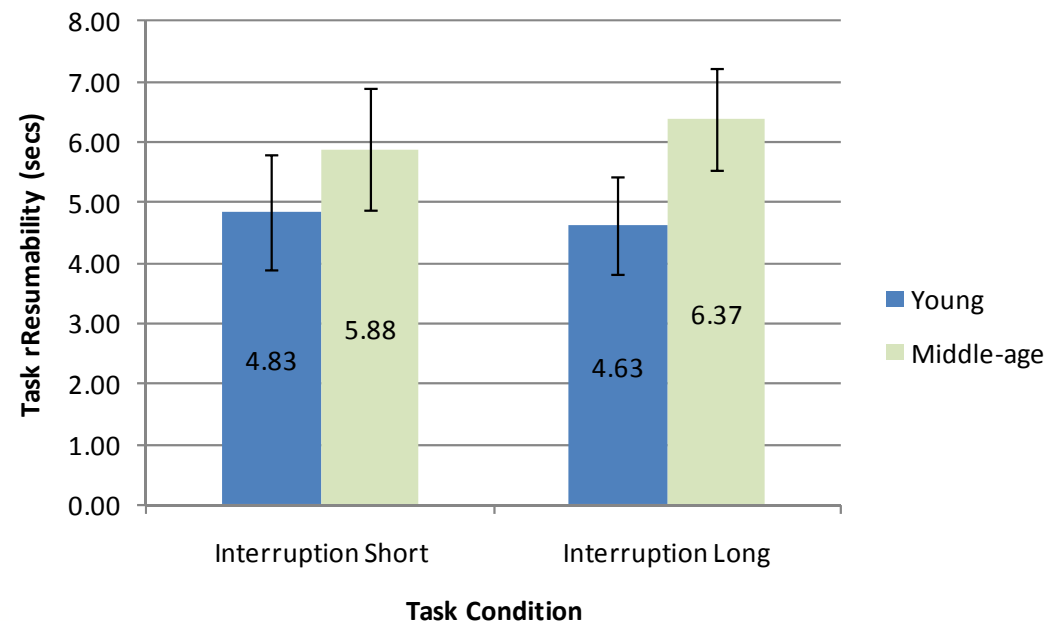
- Mean number of glances made to music player differed significantly across music task conditions



Results – Secondary Task Interruptability

Task Resumability

- Drivers took an average of 5.5 seconds (range 2.1 - 24.2 s) to resume the search tasks after the interruption
- No significant differences in task resumability across driver groups or the long and short lists



Conclusions

- Regardless of list length, engaging in music search tasks on a touch screen interface significantly degrades some driving performance measures:
 - SDLP was approximately 27% higher and drivers made 111% more lane excursions when performing the iPod music search tasks
 - Mean speed also decreased significantly
- Drivers spent, on average, 4 times longer with their eyes off the road while searching for songs than they did when driving without a competing task
- Participants took an average of 5.5 seconds to resume the iPod task after an interruption
 - High variability in resumption lag: 2 to 24 secs
- Very few differences in these measures across driver age groups

Conclusions

- But, there was evidence that drivers regulated their interaction with the iPod
- Two key task sharing strategies employed by drivers:
 - High number of short glances (<1 sec) to iPod
 - Only 7% of the glances to the device were over 2 seconds in duration
 - Delaying task resumption until driving task less demanding
- Further research should examine the effectiveness of these strategies in reducing distraction

Acknowledgements

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Thank You

Questions or more information?

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