



**EFFECTS OF DIVIDED ATTENTION ON FALSE HEARING
AND IMPLICATIONS FOR DRIVING**

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Many people wouldn't think twice about talking on the phone while driving, but studies have found that listening to speech while driving can negatively impact driving performance (Strayer & Johnston, 2001). Research in this field has found that talking on the phone while driving, even when using a hands-free device, can impair driving performance to a level that is equivalent to driving while intoxicated (Strayer et al., 2006). While these studies have attempted to make the experiments more naturalistic by using driving simulators or actual cars, one limitation that these studies have not addressed is the quality of the language. A majority of studies have used clear, easy-to-understand language that does not require any additional processing outside of normal language comprehension, but this does not reflect the quality of language often encountered when driving. In real life, your phone call might be drowned out by the sound of traffic or the radio station you're listening to might become spotty due to bad reception, resulting in the speech requiring even more effort to process. Increasing the cognitive resources going to language processing may cause resources to be pulled away from driving performance. If this is true, it suggests that these studies that used pristine language may not have identified the full range of impairment caused by listening to speech while driving in realistic environments.

However, driving performance is not the only thing impacted by this divided attention: comprehension and memory of the speech are also impaired. False hearing is the phenomenon in which an individual believes they heard a word that makes sense in the context when another word was actually said. Similarly, false memories occur when an individual remembers hearing the word that makes sense even though it was not said. Research has suggested that false hearing and false memories become more common when there is interference that causes individuals to rely on reconstructive processes and make predictions about what they heard (Rogers et al., 2012; Watson et al., 2016). Because traffic noise may interfere with hearing while driving, individuals may be more prone to false hearing and false memories when driving. To explore these relationships, we are using two experiments: one that focuses on the impact of divided attention on false hearing, and a second that attempts to expand the ecological validity of the first study by using a driving simulator. In both experiments, participants listen to sentences with the last word partially occluded by background noise and report what they hear. The sentences end with either congruent (contextually appropriate) or incongruent (contextually inappropriate) words. Of the incongruent words, half are phonological lures that sound like the congruent word, while the other half are not phonologically similar but equally incongruent, so this could be seen as the baseline incongruent condition. Comparing performance between the two incongruent conditions will reveal false hearing, as both conditions should be equally incongruent so differences will likely be due to similarities between the phonological lures and the congruent words.

Participants simultaneously complete a secondary task, which allows us to identify how dividing attention impacts performance on both the speech and secondary tasks. In the first experiment, participants do the random dot kinematogram (RDK) task, which involves tracking the movement of dots with a joystick. This task is a good precursor to the driving study because the nature of the task reflects driving. Similar to how driving involves taking in visual information and responding with movement (e.g., turning the steering wheel), this task involves monitoring a cloud of dots on the screen and then moving a joystick in the direction that the dots are moving. In the second experiment, participants are in a driving simulator and try to stay 2 seconds behind a pace car that brakes intermittently. We are recording performance data in both tasks (e.g., accuracy of dot tracking and braking reaction time) so we can identify any changes in performance due to dividing attention.

Both projects are currently ongoing, but preliminary findings from the first experiment suggest that people are making predictions about what they heard based on the context, which is leading to high rates of false hearing. We are seeing high rates of both accuracy and confidence in the congruent condition, while accuracy for both types of incongruent words is under 50%. However, false hearing rates in the phonological lure condition are close to 50%, and confidence in those responses is almost as high as in the congruent condition, suggesting participants actually believe they heard the congruent word. So far, we have not seen significant differences in false hearing rates between the divided and full attention conditions, but a full sample size is needed before we can draw any conclusions. Additionally, we may see a different pattern in the second experiment that incorporates a more demanding task. Both studies will continue running until a full sample size is obtained so that we can draw a more conclusive picture of the effects of divided attention on false hearing, as well as examine false memory rates and secondary task performance.

References

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