

Aug 16th, 12:00 AM

Effects of Speed of Visual Processing Training upon Non-Visual Attention in "At-Risk" Older Drivers

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Skaar, Nicole; Rizzo, Matthew; Bateman, Kirk; and Anderson, Steven W.. Effects of Speed of Visual Processing Training upon Non-Visual Attention in "At-Risk" Older Drivers. In: Proceedings of the First International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design, 14-17 August 2001, Aspen, Colorado. Iowa City, IA: Public Policy Center, of Iowa, 2001: 306-308.

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EFFECTS OF SPEED OF VISUAL PROCESSING TRAINING UPON NON-VISUAL ATTENTION IN “AT-RISK” OLDER DRIVERS

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Purpose

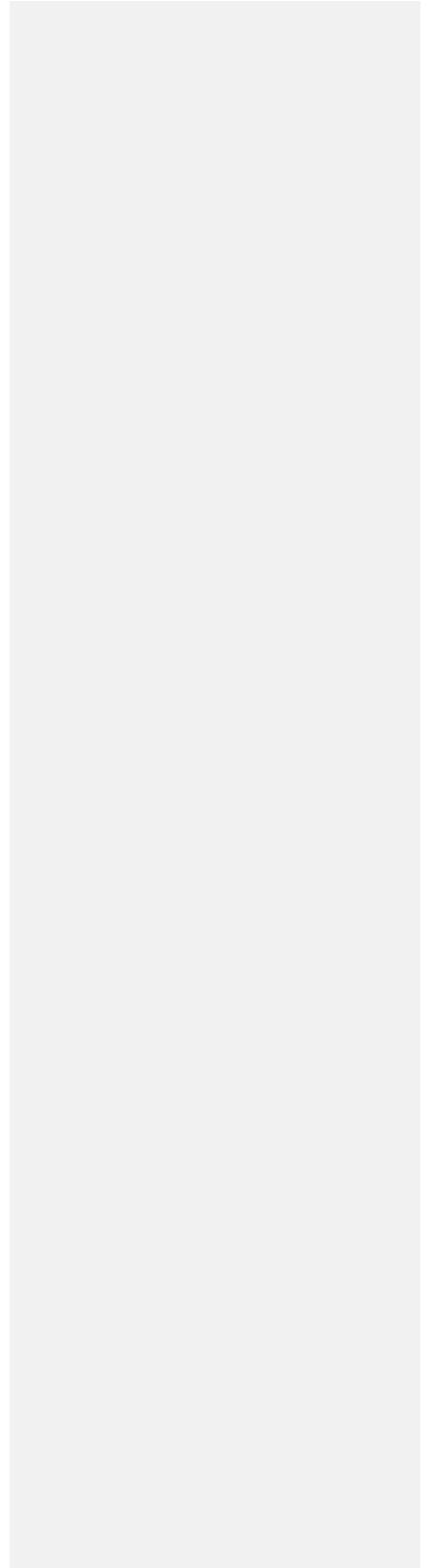
Reduction in a measure known as the Useful Field of View (UFOV) is a risk factor for car crash involvement in older drivers (Owsley et al, 1991; Ball et al, 1993). This measure depends on aspects of visual attention (divided attention [DA], selective attention [SA]) and speed of processing (Owsley et al, 1991; Ball et al., 1993). UFOV scores can be improved through speed of processing training (Ball, Beard, et al., 1988a,b), and this improvement may transfer to enhanced driving performance (Roegner et al, submitted). This preliminary analysis addresses the hypothesis that training of visual speed of processing can improve performance in attention-demanding tasks that are processed outside the visual domain.

Methods

Forty participants were enrolled in an ongoing study of at-risk older drivers based upon reduction in UFOV scores (measured using the Visual Attention Analyzer, 3000). Twenty-two participants ages 66-87 (mean age = 74.4; mean MMSE = 28.4; 65.4% male) were randomly assigned to a speed of visual processing training group and 18 participants ages 67-91 (mean age = 75.1; mean MMSE = 28.7; 52.6% male) were randomly assigned to a control group (who trained to use the Internet). Each group participated in 10 one-hour training sessions. All 40 participants also performed on a version of the Paced Auditory Serial Addition Task (Gronwall, 1977) which was administered before and after training. The PASAT requires a subject to add 60 pairs of random digits so that each is added to the digit immediately preceding it. This test places demands on working memory and sustained attention, including attention to continuously incoming auditory information, while performing a separate mental task. Driving while listening to a conversation is a common example of a task requiring this kind of attention. A cassette tape was played which contains the instructions and numbers. The numbers were presented at 2.4-second intervals and at 2.0-second intervals. We recorded the exact responses of the participants.

Results

After training, the speed of processing training group showed improvement in mean scores on all UFOV subtests (DA 66.18ms, SA 244.68ms [with identification of a foveal target] and 115.27ms [for a same/different foveal discrimination]; $P < 0.001$ Wilcoxon signed rank, all cases). The controls showed improvement only on the selective attention subtest (70ms $p = 0.049$). On the PASAT, the speed of processing training group showed improvement in mean scores on the 2.4 second PASAT (8.6%, $p = 0.01$). Results improved at the 2.0 second interval task, but this difference was not significant (4.4%, $P = 0.11$) - possibly due to a floor effect at this difficult speed. The control group did not improve their PASAT scores significantly at either PASAT speed (3.0%, $P = 0.51$ at 2.4 second and 3.8%; $P = 0.22$ at 2.0 second intervals).



Conclusion

Training of speed of visual processing improved performance on visual attention tasks, as expected. We also found preliminary evidence of crossmodal transfer of these training effects leading to improvement on the PASAT, a task that commands both auditory attention and working memory. These preliminary findings suggest that speed of visual processing intervention may entrain attention resources at supramodal levels outside the visual modality. Improvement of attention in tasks outside the visual domain after training of visual speed of processing may be relevant to performance in tasks during driving such as multitasking, using a cell phone, and engaging in conversation with a passenger.

References

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Supported by NIA AG15071 and NIA P50 AG11684