

Auditory target detection in real-life settings: insights from mobile electroencephalogram (EEG) recordings

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Silent counting of target stimuli elicits attenuated auditory P3 components during walking when compared to seated conditions (De Vos et al., 2014; Debener et al., 2012). We questioned if placing additional demands on the motor system by requiring a within-modality response (hand-held button press) would further attenuate the P3 during walking. We also evaluated the contribution of the changing perceptual environment on the P3. EEG recordings from a mobile system assessed the influence of action (seated/walking) and environmental (indoors/outdoors) factors on attentional auditory processes. An auditory oddball task was repeated in four conditions (indoor seated, indoor walking, outdoor seated, outdoor walking) for two independent experiments varying by response mode. Target tones were acknowledged with a button press in experiment 1 (n = 18) and by silent counting in experiment 2 (n = 16). Dissociable effects were evident between each experiment with action effects found for the button press experiment, and environment effects for the counting experiment. P3 analysis showed reduced amplitudes to target tones when walking and executing a button press. When counting targets, the same effect of action was absent; but amplitudes elicited decreased when outdoors compared to indoors; equally, no environment effect was observed when executing a button press. These findings support the hypothesis that cognitive processes normally observed under laboratory conditions are differentially allocated when perceptual and motor demands are increased. Accordingly, models of dynamic cognitive interactions may be further informed by research conducted within settings reflecting the complexity of real-life.

- (1) De Vos, M., Gandras, K., & Debener, S. (2014). Towards a truly mobile auditory brain-computer interface: Exploring the P300 to take away. *International Journal of Psychophysiology: Official Journal of the International Organization of Psychophysiology*, 91(1), 46–53.
- (2) Debener, S., Minow, F., Emkes, R., Gandras, K., & de Vos, M. (2012). How about taking a low-cost, small, and wireless EEG for a walk? *Psychophysiology*, 49(11), 1449–53.