

Abstract

This study aims to investigate spatial and verbal working memory in typically developing children and the role that reward processing plays in their working memory performance. Reward processing is important to look at in order to obtain a better understanding of the functions that are affected by reward, such as working memory. Three levels of reward have been examined in this study to assess the effects of reward size and reward delay; large delayed reward, large immediate reward, and small immediate reward. The paradigm that was used in this experiment was the “n-back” task in which subjects decided for each stimulus in a series whether it matched the one presented n-times back in the series (Owen et al., 2005). The subjects were instructed to remember either the identity or the location of a letter stimulus during small and large immediate, and large delayed reward conditions. Variations in task difficulty were accomplished by alternating the load of the task from one to two items. Pilot results using multivariate ANOVA indicate that significant effects were found in task [$F(1,19) = 40.801, p < .001$], reward [$F(2,38) = 6.652, p < .01$], load [$F(1,19) = 55.693, p < .001$], and significant interactions between task and reward [$F(2,38) = 5.389, p < .01$], and between task and load [$F(1,19) = 14.278, p < .01$]. There was a significant difference found between verbal and spatial tasks, where the participants performed worse on the spatial tasks, particularly at the 2-back level. Reward was found to have a differential effect on verbal and spatial tasks, where participants performed better on the verbal task in the large delayed condition, but better on the spatial task in the large immediate condition. Therefore, the spatial tasks appear to benefit from immediate feedback whereas the verbal tasks appear to benefit from delayed feedback. These pilot results clearly show that there is an effect of reward on accuracy scores.

Owen, Adrian, McMillan, K., Laird, A., and Bullmore, E. (2005). “N-Back Working Memory Paradigm: A Meta-Analysis of Normative Functional Neuroimaging Studies.” Human Brain Mapping 25:46-59.