Effective on Development of Proportional Reasoning Skill of Physical Experience and Cognitive Abilities Associated with Prefrontal Lobe Activity

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Source: Journal of Research in Science Teaching, 37(10), 1171-1182

Abstract: The present study tested the hypothesis that maturing prefrontal lobes play a role in the development of proportional reasoning skill because the prefrontal lobes are involved in the inhibition of task-irrelevant information and the representation of task-relevant information. The hypothesis that reasoning development is in part dependent upon physical experience was also tested. Students (all males) who failed to solve a diagnostic proportions task were administered several tests of prefrontal lobe functions. The students were then randomly assigned to manipulative or verbal tutoring groups. Both groups received a series of individual testing, tutoring and testing sessions on proportional reasoning. As predicted, performance on the prefrontal lobe tasks (measures of inhibiting ability, planning ability, disembedding ability, and working memory capacity) significantly predicted performance on proportional reasoning tasks following tutoring. Students' computational skills were not a significant predictor. Also, the manipulative group's proportional reasoning performance was significantly higher than that of the verbal tutoring group. Therefore, the present results provide support for the hypothesis that maturing prefrontal lobes and physical experience play roles in the development of proportional reasoning skill. © 2000 John Wiley & Sons, Inc. J Res Sci Teach 37: 1171-1182, 2000