

ORAL: DEVELOPMENTAL DIFFERENCES IN COGNITIVE EFFICIENCY AND INVOLVEMENT AMONG CHILDREN AND ADULTS WHEN SOLVING THE TOWER OF HANOI PUZZLE

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Objective. To determine developmental differences in cognitive efficiency and mental involvement measured by the relationship between prefrontal cortex oxygenation and behavioral performance in typically developing children and adults as they learn to perform the Tower of Hanoi puzzle. **Method.** We examined hemodynamic activity in the prefrontal cortex (PFC) in younger (YC) and older (OC) children and adults (AD) as they performed the Tower of Hanoi (TOH) disc stacking task in two different conditions (manual (3D) and computer (2D)). Fourteen adults (24.6 ± 2.8 , 10 older (12.8 ± 1.7) and 7 younger (9.0 ± 1.2) children solved puzzles in 2 blocks of 3, 1-minute epochs. Block order was randomized between 3D and 2D. Δ HBO values from the PFC were collected to as a measure of mental effort and # of puzzles solve measured behavioral performance. For each participant, these measures were graphed in relation to each other. Cognitive efficiency and mental involvement were calculated according to Paas et al (2005) and statistically compared within each age band between those who started with 3D and with 2D. **Results.** All three age groups starting with 3D in block 1 had low NE in block 1 and significantly higher efficiency in Block 1 ($p = .05$). Adults and older children starting with 2D in block 1 did not differ in NE in their second block. However, young children who started in 2D did improve significantly in Block 2. In mental involvement, both adults and older children who started in 3D in block 1 significantly decreased by Block 2. No other differences existed. **Implications.** In both adults and children, learning to solve the manual puzzle first facilitated skill transfer and resulted in greater cognitive efficiency in block 2. Only the youngest children significantly improved cognitive efficiency when starting with the 2D task. Mental involvement, a measure of performance motivation, decreased significantly by Block 2 only in adults and older children who began with 3D. This suggests that after learning the task, these groups were no longer engaged in the process of puzzle solving. Mental involvement did not differ for young children, nor was it ever a positive value. This suggests that little adaptive learning took place for this group, who may benefit from additional instruction or practice.