

Trainability of Executive Functions during Preschool Age Analysis of Inhibition of 5-Year-Old Children

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Abstract : Introduction: In the recent past, discussions on the importance of physical activity for child development have contributed to a growing interest in executive functions, which refer to cognitive processes. By controlling, modulating and coordinating sub-processes, they make it possible to achieve superior goals. Major components include working memory, inhibition and cognitive flexibility. While executive functions can be trained easily in school children, there are still research deficits regarding the trainability during preschool age. Methodology: This quasi-experimental study with pre- and post-design analyzes 23 children [age: 5.0 (mean value) \pm 0.7 (standard deviation)] from four different sports groups. The intervention group was made up of 13 children (IG: 4.9 \pm 0.6), while the control group consisted of ten children (CG: 5.1 \pm 0.9). Between pre-test and post-test, children from the intervention group participated special games that train executive functions (i.e., changing rules of the game, introduction of new stimuli in familiar games) for ten units of their weekly sports program. The sports program of the control group was not modified. A computer-based version of the Eriksen Flanker Task was employed in order to analyze the participants' inhibition ability. In two rounds, the participants had to respond 50 times and as fast as possible to a certain target (direction of sight of a fish; the target was always placed in a central position between five fish). Congruent (all fish have the same direction of sight) and incongruent (central fish faces opposite direction) stimuli were used. Relevant parameters were response time and accuracy. The main objective was to investigate whether children from the intervention group show more improvement in the two parameters than the children from the control group. Major findings: The intervention group revealed significant improvements in congruent response time (pre: 1.34 s, post: 1.12 s, $p < .01$), while the control group did not show any statistically relevant difference (pre: 1.31 s, post: 1.24 s). Likewise, the comparison of incongruent response times indicates a comparable result (IG: pre: 1.44 s, post: 1.25 s, $p < .05$ vs. CG: pre: 1.38 s, post: 1.38 s). In terms of accuracy for congruent stimuli, the intervention group showed significant improvements (pre: 90.1 %, post: 95.9 %, $p < .01$). In contrast, no significant improvement was found for the control group (pre: 88.8 %, post: 92.9 %). Vice versa, the intervention group did not display any significant results for incongruent stimuli (pre: 74.9 %, post: 83.5 %), while the control group revealed a significant difference (pre: 68.9 %, post: 80.3 %, $p < .01$). The analysis of three out of four criteria demonstrates that children who took part in a special sports program improved more than children who did not. The contrary results for the last criterion could be caused by the control group's low results from the pre-test. Conclusion: The findings illustrate that inhibition can be trained as early as in preschool age. The combination of familiar games with increased requirements for attention and control processes appears to be particularly suitable.

Keywords : executive functions, flanker task, inhibition, preschool children

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