

**BAR ILAN UNIVERSITY**

**The Effect of Training to Improve Executive  
Functions with Multitasking Performance among  
Children with ADHD**

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## Abstract

Executive functions refer to a group of cognitive skills that allow for the control and regulation of thought, feeling and action, and therefore contribute to the promotion of different goals. These functions are required in casual cognitive act expressed in everyday life, which demands the combination of some of the following skills: inhibition, working memory, organization, emotional control, initiation, cognitive flexibility, switch, diligence, planning, problem resolution and monitoring. Deficiencies in executive functions resemble a journey without a map, or an orchestra without a conductor. Research have demonstrated a direct relation between ADHD (attention deficit and hyperactivity disorder) and hardships in executive functions. Therefore, it is important to examine the difficulties in executive functioning among population with ADHD, in order to seek for ways to assist them and provide them with strategies to improve these skills.

Many human behaviors are composed of the performance of some tasks simultaneously, (e.g.: driving and talking; drinking coffee and typing etc.). Observing human behaviors in natural environments reveals that people are engaged in multitasking (MT) during most of their time. These MT missions require the simultaneous enactment of several executive functions, and demand self regulation, planning and continuous decision making.

The present study aims to examine the effect of a computerized training to improve some executive functions (inhibition, switch and working memory) among children with ADHD, on the performance of a MT task.

The study outline is a 2X3 pre /post, in which three groups were compared in the performance of a MT task: the study group A was composed of children with ADHD which underwent a computerized training to improve their executive functions; a control group B was composed of children with ADHD that underwent a neutral intervention (computer games); and control group N was composed of children without ADHD with a computerized training for executive functions.

The study included 58 children aged 9-12; 36 boys and 22 girls, among which 36 were diagnosed as having ADHD, by authorized factors. All participants were administered a MT task pre and post the intervention, the performance measures (dependent variables) were:

amount of tasks, amount of glances in the clock during the task, and the rate of rule breaks. The measures of the MT task and the interventions took place during 6 consecutive weeks, with each participant trained and measured by the researcher solely, in the location of his regular school.

Consolidating the research hypotheses, we expected to find differences between the primary (pre-) performance of children with ADHD, and children without ADHD, in MT task. The second hypothesis was that children with ADHD would show a higher improvement in MT following the executive functions training, than both the control groups (ADHD without training, and non-ADHD with training).

In accordance with the hypotheses, we found that children without ADHD performed better in the MT task prior to the intervention, and that the improvement in performance (post vs. pre) was highest among children with ADHD following a computerized training for executive function, compared to both children without ADHD that underwent the training, and children with ADHD that underwent a neutral intervention. These findings were found mainly significant for amount of tasks performed within the MT mission, but less for amount of glances in the clock, and rate of break rules.

Our findings bear some significant implications regarding the impact and implementation of training of executive functions, on the performance of multitasking missions and consequently, on a wide variety of actions, among children with ADHD. These implications, as well as some recommendations for further research, are discussed.