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Learning and formation of procedural memory in Adolescents Diagnosed with ADHD

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Abstract

Motor learning and the creation of procedural memory are essential components in acquisition of many daily and academic skills. Research shows that the development of procedural learning among young male adults who have Attention Deficit Hyperactivity Disorder (ADHD) is different to that of their peers with regular development. Cognitive impairments in Attention Deficit Disorder are connected to difficulties in executive functions. This might be related to difficulties in the process of obtaining motor skills. Youth diagnosed with ADHD were found to suffer difficulties in motor skills, which require numerous exercises, as well as difficulties in using memory strategies. These difficulties are probably caused by a learning process disorder, which stem from the ADHD.

In this research, a comparison was made between 16 male teenagers diagnosed with ADHD, who are not treated with medication and 16 teenagers who do not have ADHD. The experiment tested the learning ability as well as the formation of long-term memory required for this. Participants trained on a finger opposition sequence (FOS) task. Learning the sequence reflects a learning process connected to the formation of the long-term procedural memory. In the research, two main dependent variables were tested: first, the speed of performance of the acquired sequence within a set timeframe and second, the accuracy of the performance of this sequence. These variables were tested repeatedly at four different points of time during the training process: at the beginning and end of the training, 24 hours and 2 weeks after the training.

The initial research hypothesis was that FOS learning would become faster and more accurate as the learning stages progress among participants in general and those with ADHD in particular.

The second research hypothesis was that there would be a difference between the two groups regarding the memory formation stage. Furthermore, 24 hours after the learning, the improvement in the accuracy of the performance among the teenagers who were not diagnosed with ADHD will be more substantial than that of those who were diagnosed with ADHD.

The results of the research show that as the learning stages progressed performance became faster and more accurate in both groups of examinees. The findings of this experiment indicate a learning process in the speed and accuracy of the motor task among the teenagers diagnosed with ADHD. The findings showed, that in addition to proving effective, learning at the training stage, among the teenagers with ADHD, there was also evidence of improvement of the motor memory consolidation in this group. However, the findings revealed that the speed at which the task was performed, within the group of teenagers who did not have ADHD, were better than those who were diagnosed, throughout the various time periods.

Furthermore, the degree of delayed improvement (delayed gains "off-line") from one day after the training until two weeks after the training (without additional training) in the speed of performance was higher among the examinees with ADHD. However, it is important to note that this difference between the groups could derive from the fact that the starting point of the teenagers with ADHD was lower 24 hours after the training (in fact, their performance was lower along the training, too) therefore, there

was more potential for improvement. Having said that, it is possible that the findings show a delayed improvement in performing the task.

Furthermore, the findings showed that the teenagers with ADHD tended to improve the accuracy in performing the task less than the examinees in the second group in the stage between the end of the training and 24 hours after it. This finding is similar to the findings of research made with young women, which showed difficulty with accuracy at the stage of memory consolidation (Adi-Japha et al; 2011).

The importance of this research is in the understanding that despite the slow motor performance of the teenagers with ADHD, in comparison to those without ADHD, the findings of the research show that there is an effective procedural learning process. In addition, there is also a process of effective consolidation of the motor memory and retention of the learning achievements for the long term.

ADHD and its various impairments is a common impairment within the population and it is becoming more and more common. The impairments in the process of skill learning found in the current study might affect the individual suffering from them, hurt academic and social abilities and even cause low self-esteem in the critical era of puberty. Therefore, it is extremely important to create an environment, which is aware of the difficulties which stem from the impairment and which is adapted to the needs of these individuals. A suitable environment can maximize the potential of the teenagers with ADHD, promote their abilities, and will to integrate and progress.