
The Use of Cognitive Digital Games in School: Contributions to Attention

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Cognitive games involve a number of different games working aspects of human cognition, while proposing the intersection between the sets of concepts, fun and cognition, for the improvement of cognitive functions. The attention is the main point made in this study, since it is fundamental to the learning process and be recurring complaint among parents and teachers in schools.

With respect to the contributions of digital games to improvement of cognitive processes, researchers suggest that regular practice has a significant influence on improving the performance related to basic visual skills (Li, Polat, Scalzo, & Bavelier, 2010); on the ability to perceive objects simultaneously (Dye & Bavelier, 2010; Feng, Spence, & Pratt, 2007); and on the ability to do more than one task at the same time (Boot, Kramer, Simons, Fabiani, & Gratton, 2008). Other studies specifically investigate the use of digital games in the school context and suggest potential for digital game use to improve of student's attention span at preschool age (Rueda, Checa, & Cómbita, 2012), to improve overall intelligence capacity of elementary school children (Miller & Robertson, 2010), and to better performance of working memory ability (Klingberg et al., 2005; Thorell, Lindqvist, Nutley, Bohlin, & Klingberg, 2009).

Considering the importance of the proper functioning of attention, because of its involvement in the regulation of thoughts and emotions, maintaining the performance of this process is very important, especially in school, where the child must acquire content in an environment full of countless distractors. The study in question focuses on the attention, proposing and evaluation in the context of the

classroom. Thus, it suggests the use of digital games in an integrated way the school activities in the classroom.

The games have features like increasing challenges, rules that establish what can and cannot be done, and involvement of the player in the quest to gain skills and win the game (Kirriemuir & McFarlane, 2004; Prensky, 2006).

We aim to investigate the contributions of the use of a system that integrates cognitive digital games to a database, of the Escola do Cérebro, for monitoring and improvement of cognitive skills, highlighting the attention. The games involve challenges and rules involving the exercise of cognitive functions, especially the working memory, attention and capacity of solving problems.

The study combines qualitative and quantitative approaches. It collects the data based on the observation of the proposed interventions as well as interviews conducted with participating teachers and students to identify their perceptions of digital games' contributions to the learning process. Furthermore, before and after the implementation of the intervention, we performed a D2 Test of attention that measures selective and sustained attention, as well as visual scanning accuracy and speed.

The intervention consisted in the use of the Escola do Cérebro, using tablets in the classroom, daily for a period of five weeks. The sample consisted of 71 students of the Application School of Basic Education, Federal University of Santa Catarina, aged 7 and 9 years old ($M = 7.64 \pm 1.12$), which were divided into two groups: participant and control. The first ($n = 31$) participated in the intervention, the control group ($n = 40$) was only evaluated using the test before and after the same time interval of interventions.

The Escola do Cérebro is a platform that integrates seven digital games into a database. The application allows visualization of the player's performance and offers the possibility of monitoring by teachers. Students have their scores measured by four variables: time, speed, stability and accuracy.

A statistical analysis was performed based on the application of the paired t-test on the difference of the overall score obtained in the test before and after the intervention in the two groups. The difference in the results obtained from the application of D2 Test of attention before and after was statistically significant ($p < 0.05$), the participant group had mean and standard deviation 60.23 (64.75) respectively, while the control group was 20.00 (42.65).

The result indicates significant improvement in the performance of the sustained attention in the test, as well as a high dispersion, which reveals a variation in relation to the performance.

In addition, students participating in the interview reported a preference for games that involve problem solving, recognize the need to plan actions in relation to their importance for the game and for daily activities, and realize improvements in the ability to sustain attention. The teachers observed changes after the intervention, emphasizing the greater persistence and involvement in school activities, and in some students, improvement in the ability to sustain attention. From this, we conclude that an intervention based on cognitive digital games offers contributions to the learning process and improvement of sustained attention.

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