A Study on the Validity of a Computer-Based Game to Assess Cognitive Processes, Reward Mechanisms, and Time Perception in Children Aged 4-8 Years.

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JMIR Serious Games. 2016 Sep 22;4(2):e15.
doi: 10.2196/games.5997.

Abstract

BACKGROUND:
A computer-based game, named Timo's Adventure, was developed to assess specific cognitive functions (eg, attention, planning, and working memory), time perception, and reward mechanisms in young school-aged children. The game consists of 6 mini-games embedded in a story line and includes fantasy elements to enhance motivation.

OBJECTIVE:
The aim of this study was to investigate the validity of Timo's Adventure in normally developing children and in children with attention-deficit/hyperactivity disorder (ADHD).

METHODS:
A total of 96 normally developing children aged 4-8 years and 40 children with ADHD were assessed using the game. Clinical validity was investigated by examining the effects of age on performances within the normally developing children, as well as performance differences between the healthy controls and the ADHD group.

RESULTS:
Our analyses in the normally developing children showed developmental effects; that is, older children made fewer inhibition mistakes ($r=-.33$, $P=.001$), had faster (and therefore better) reaction times ($r=-.49$, $P<.001$), and were able to produce time intervals more accurately than younger children ($q=.35$, $P<.001$). Discriminant analysis showed that Timo's Adventure was accurate in most classifications whether a child belonged to the ADHD group or the normally developing group: 78% (76/97) of the children were correctly classified as having ADHD or as being in the normally developing group. The classification results showed that 72% (41/57) children in the control group were correctly classified, and 88% (35/40) of the children in the ADHD group were correctly classified as having ADHD. Sensitivity (0.89) and specificity (0.69) of Timo's Adventure were satisfying.

CONCLUSIONS:
Computer-based games seem to be a valid tool to assess specific strengths and weaknesses in young children with ADHD.