The Effect of Serious Game on Cognitive Improvement in Children with Developmental disabilities: A Randomized Clinical Trial

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Introduction

Early interventions are important to improve cognitive function of children suffered from developmental disabilities (DD). However, intervention and screening for DD require financial and human resources for implementation. In that this requirement is relatively free and there is no time and spatial constraint, serious games designed to change cognitive ability or behavior for health using smart device are getting attention. However, there has been minimal research regarding the effect of serious games for intervention. The objective of this study is to identify the effect of serious game on cognitive improvement in children with developmental disabilities.

Methods

DoBrain is a serious game based on animated cartoon and the objective of this game is to enhance primary cognitive and, high-level thinking abilities (URL). The randomized clinical trial based on single-blinded, parallel was performed on children aged five to seven years old. We conducted Wilcoxon signed rank test to identify the effect of intervention by comparing the K-WPPSI scores. Also, Mann-Whitney U test was performed to investigate the effect of serious game (DoBrain) by comparing the improvement of scores in both groups. Further, we compared PEP-R, BOT-2, and PEDI scores to verify effect of this serious game on developmental disabilities group in detail.

Result

Full Scale IQ increased in both intervention group and control group, although there was not significant difference in it ($P=0.11, n=21; P=0.36, n=18$ respectively) (Table 1). However, K-WPPSI scores of intervention group were more improved than those of control group ($n=38$, median difference $\geq 2$ respectively).

Table 1. A summary of outcome before and after intervention.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Intervention (n=21)</th>
<th>Control (n=18)</th>
<th>p-value (Wilcoxon signed rank test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale IQ</td>
<td>Pre test (T1) 92.05 (28.84)</td>
<td>Post test (T2) 90.25 (27.10)</td>
<td>0.11</td>
</tr>
<tr>
<td>Verbal comprehension</td>
<td>Pre test (T1) 96.52 (26.46)</td>
<td>Post test (T2) 108.05 (25.63)</td>
<td>0.15</td>
</tr>
<tr>
<td>Visual Spatial</td>
<td>Pre test (T1) 92.43 (24.70)</td>
<td>Post test (T2) 102.90 (24.84)</td>
<td>0.12</td>
</tr>
<tr>
<td>Fluid Spatial</td>
<td>Pre test (T1) 102.10 (23.72)</td>
<td>Post test (T2) 101.71 (22.51)</td>
<td>0.06</td>
</tr>
<tr>
<td>Working Memory</td>
<td>Pre test (T1) 105.95 (24.04)</td>
<td>Post test (T2) 109.76 (21.91)</td>
<td>0.60</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>Pre test (T1) 98.19 (18.66)</td>
<td>Post test (T2) 98.10 (20.32)</td>
<td>0.14</td>
</tr>
</tbody>
</table>

* Estimated between group difference (intervention – control) after intervention (Post-test, T2), for pre-test (T1) values.

Conclusion

The serious game called DoBrain can help children improve cognitive function in children.

References


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1 https://www.thegreatapps.com/apps/dobrain-best-learning-app-for-children