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) [1]. However, intervention and screening for DD require financial and human resources for implementation[2, 3]. In that this requirement is relatively free, serious games using mobile phone are getting attention[4,5]. 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

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 ≥ 3 respectively).

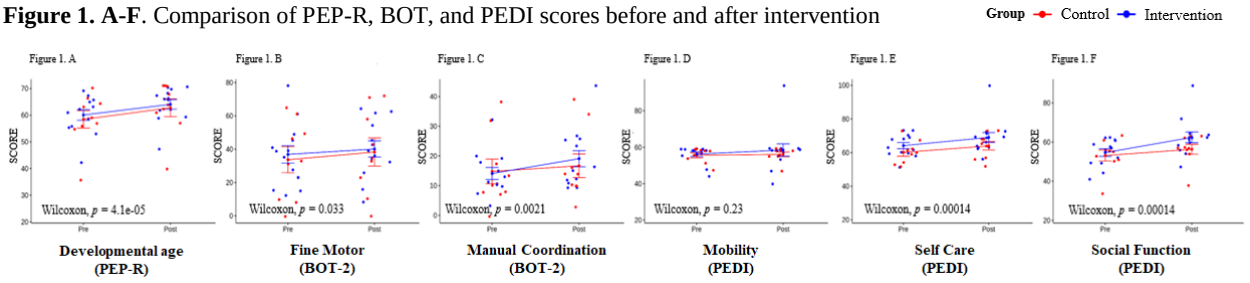
Table 1. A summary of outcome before and after intervention.

Outcome	Intervention (n=21)		*P*-value (Wilcoxon signed rank test)	Control (n=18)		*P*-value (Wilcoxon signed rank test)	Median difference between groups[a] (Mann-Whitney U test)		
	Pre test (T1)	Post test (T2)		Pre test (T1)	Post test (T2)		Median difference	95% CI	*P*-value
K-WPPSI-IV									
Full Scale IQ	92.05 (26.84)	105.24 (27.10)	0.11	96.83 (18.81)	104.00 (20.53)	0.37	9.00	(4.00, 13.00)	0.0005
Verbal comprehension	96.52 (26.46)	108.05 (25.63)	0.15	94.33 (21.02)	101.89 (20.27)	0.06	5.00	(-1.0, 10.00)	0.1336
Visual Spatial	92.43 (24.70)	102.90 (24.84)	0.12	92.11 (21.26)	98.11 (21.61)	0.17	3.00	(-1.00, 9.00)	0.1599
Fluid Spatial	90.24 (21.92)	101.71 (22.51)	0.06	107.67 (22.10)	108.89 (20.67)	0.26	5.00	(0.00, 10.00)	0.0796
Working Memory	105.95 (24.04)	109.76 (21.91)	0.60	93.78 (17.45)	98.11 (16.18)	0.78	3.00	(-1.00, 6.00)	0.1944
Processing Speed	89.19 (18.66)	98.10 (20.32)	0.14	96.72 (20.74)	101.44 (21.01)	0.40	3.00	(0.00, 9.00)	0.0254

[a] Estimated between-group difference (intervention – control) after intervention (Post-test, T2) , for pre-test (T1) values

There were significantly differences in PEP-R, BOT-2, PEDI scores of developmental disabilities children except for mobility score in PEDI (*P*<0.05 respectively, n=22) (Figure 1.A-F)

Figure 1. A-F. Comparison of PEP-R, BOT, and PEDI scores before and after intervention



Conclusion

Serious games can help cognitive functioning in children with developmental disabilities.

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