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Comparison of Computer-assisted Cognitive Rehabilitation Effects between Stroke and TBI

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Objective
Stroke and traumatic brain injury lead to cognitive, neurological disorders, which can result in many difficulties at daily living. The purpose of this study is to investigate the difference in treatment results between stroke and traumatic brain injury.

Methods
Sixty-one adults with brain damage were recruited retrospectively in this study. Thirty-three people who had suffered from stroke and 28 from traumatic brain injury(TBI) were involved. Before and after computer-assisted cognitive rehabilitation, all participants were assessed their cognitive function using Computerized Neuropsychological Test(CNT, Version 4.0, Maxmedica). Computerized Neuropsychological Test is composed of 6 components; verbal memory, visual memory, attention, visuo-motor coordination and high cognition tests. All participants were received 30 sessions of computer-assisted cognitive rehabilitation(Comcog, Maxmedica), five times per week. Each sessions were proceed for 30minutes. The comparison of treatment effects were statistically analyzed using SPSS.

Results
Before cognitive rehabilitation, there was no significant difference between the two groups in each contents of CNT. After treatment, considering all patients as one group, people showed improvement in almost all CNT contents. Comparing the results between two groups, All components except visual learning test and word color test were improved in the stroke patients. Meanwhile, in the TBI patients, there was no significant difference between before and after treatment at digital span backward, auditory CPT, visual CPT, and card sorting test.

Conclusions
Computer-assisted cognitive rehabilitation is widely used tool for patients with cognitive impairments. According to present study, in contrast to stroke patients, TBI patients didn't

show significant difference before and after treatment at the digital span backward, auditory CPT, visual CPT, and card sorting test. These components are related to ability regarding attention, inhibition, and high cognition, and are thought to be deeply associated to the frontal region of the brain. Traumatic brain injury, which can cause diffuse injury to the brain, is more likely to cause damage to the frontal area than stroke is. Consequently, response to cognitive rehabilitation shows different patterns.

Table 1. Demographics

		Stroke	TBI	Total	p
n		33	28	61	
Age		60.3(15.3)	58.8(17.5)	59.6(16.2)	0.713
Sex, ratio(M:F)		19:14	21:7		
type of injury(IS:HS, TBI)		16:17	28		
Severity(NIHSS for stroke, GCS for TBI)		11.3(7.0)	9.9(3.9)		
Post onset duration		65.8(48.3)	69.4(39.1)	67.4(44.0)	0.749
MMSE		18.5(7.3)	17.6(6.1)	18.1(6.8)	0.579
MBI		42.0(27.3)	48.6(27.9)	45.1(27.5)	0.357
Education	<10 yrs	15	13	28	
	≥10yrs	18	15	33	

HS : Hemorrhagic stroke, IS : Ischemic stroke, TBI : Traumatic brain injury, MBI : Modified bathel index

Table 2. Effect of Computer-assissted cognitive rehabilitation in all subjects.

	test	Baseline	After treatment	p
Verbal memory test	Digital Span forward	33.0(9.2)	37.8(13.2)	<0.001*
	Digital Span backward	30.3(9.9)	33.6(11.0)	0.009*
	Verbal Learning	25.6(8.2)	28.8(8.7)	0.002*
Visual memory test	Visual Span forward	30.0(11.1)	34.3(10.7)	0.002*
	Visual Span backward	29.1(10.5)	33.3(9.3)	0.003*
	Visual Learning	35.2(12.8)	41.3(11.3)	0.001*
Attention test	Auditory CPT	29.3(8.3)	33.6(17.5)	0.036*
	Visual CPT	34.3(15.3)	40.8(19.6)	0.006*
Visuo-motor coordination	Trail Making A	20.0(14.4)	26.9(14.1)	<0.001*
	Trail Making B	10.7(16.3)	19.0(19.8)	<0.001*
High cognition test	Card Sorting Test	13.4(20.7)	23.7(24.9)	<0.001*
	Word Color Test	26.9(11.5)	28.8(11.0)	0.164

*p<0.05

Table 3. Comparision of the effects of Computer-assissted cognitive rehabilitation in patients with stroke and traumatic brain injury.

	test	Baseline		After treatment		p^{A}	p^{B}	p^{C}
		Stroke	TBI	Stroke	TBI			
Verbal memory test	Digital Span forward	31.3(7.7)	35.0(10.4)	36.0(12.0)	39.9(14.5)	0.001*	0.012*	0.967
	Digital Span backward	28.4(9.3)	32.5(10.3)	31.8(10.5)	35.6(11.5)	0.009*	0.169	0.732
	Verbal Learning	25.9(9.1)	25.2(7.4)	29.2(11.4)	28.4(3.6)	0.022*	0.035*	0.926
Visual memory test	Visual Span forward	29.1(11.9)	31.1(10.0)	34.1(11.3)	34.6(10.3)	0.027*	0.020*	0.262
	Visual Span backward	28.5(12.6)	29.6(7.5)	32.1(8.0)	34.7(10.6)	0.034*	0.004*	0.843
	Visual Learning	35.8(13.9)	34.4(11.5)	39.5(12.6)	43.3(9.4)	0.173	0.001*	0.248
Attention test	Auditory CPT	29.1(8.5)	29.4(8.2)	35.7(18.0)	31.2(16.9)	0.027*	0.545	0.142
	Visual CPT	34.0(14.5)	34.6(16.5)	42.0(18.2)	39.4(21.5)	0.006*	0.232	0.225
Visuo-motor coordination	Trail Making A	18.9(13.7)	21.5(15.2)	26.1(15.1)	27.8(13.1)	0.004*	0.008*	0.188
	Trail Making B	11.1(15.1)	10.2(17.9)	20.1(19.1)	17.6(20.8)	0.001*	0.011*	0.560
High cognition test	Card Sorting Test	13.5(19.3)	13.4(22.4)	27.3(23.4)	19.5(26.5)	0.001*	0.055	0.190
	Word Color Test	26.1(10.9)	27.9(12.2)	26.5(10.9)	31.6(10.6)	0.824	0.103	0.204

*p<0.05