

뇌신경재활

게시일시 및 장소 : 10 월 18 일(금) 13:15-18:00 Room G(3F)

질의응답 일시 및 장소 : 10 월 18 일(금) 16:09-16:13 Room G(3F)

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Effect of EMG biofeedback-based mobile game for upper limb rehabilitation in stroke patients

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Introduction

Electromyographic (EMG) biofeedback induces the motions necessary for rehabilitation through the feedback of the EMG signal. However, the rehabilitation program using EMG biofeedback has limitations in utilizing and attracting the interest of stroke patients. Therefore, a new EMG biofeedback rehabilitation program is needed, which is more therapeutically accessible and increases patient's interest and participation. The purpose of this study was to investigate the effects of a new rehabilitative program, integrating a mobile game and a wearable device based on EMG biofeedback and motion sensing, on the recovery of upper limb function in stroke patients.

Methods

The mobile game was designed to enable rehabilitative training through games reflective of flexion, extension, abduction, and adduction identified by motion sensors along with grasping motions recognized by EMG signals measured by the wearable device. Twenty-six participants with upper extremity motor impairment within 3 months after stroke were included in this study. Participants were randomized to either the intervention group or the control group. The intervention group (n=14) received 30 min of conventional occupational therapy (OT) and 30 min of the EMG biofeedback-based mobile game training. The control group (n=12) received conventional OT alone for 1 h per day. Rehabilitation consisted of 10 sessions of therapy, 5 days per week, for 2 weeks. The outcome measures were Manual Function Test (MFT), Fugl-Meyer Assessment (FMA), Box and block test (BBT), Manual Muscle Testing (MMT), and modified Barthel index (MBI). Participants were assessed before treatment (pre), after 2 weeks of treatment (post), and at 1 month (2 weeks after the end of treatment, 1mo). Statistical analysis was performed using independent sample t-tests and repeated measures ANOVA.

Results

The baseline characteristics showed no significant differences between the two groups. Both groups showed significant within-group improvement in the FMA, MFT, BBT, MMT and MBI after treatment and at 1month ($p<0.05$). There was a significant interaction effect in MFT ($p<0.05$), but not in other measures. Changes in the MFT (pre vs. post and pre vs. 1 mo) were significantly greater in the intervention group than in the control group ($p<0.05$).

Conclusion

This EMG biofeedback-based mobile game was more effective in improving upper limb function than the conventional OT in the stroke patients. This game appears to be feasible and can be used as an alternative to standard rehabilitation.

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Table 1. Baseline characteristics of the participants

	Intervention group (N=14)	Control group (N=12)	p value
Age	60.64±12.06	59.50±12.65	0.816
Sex, men (%)	11 (78.6)	9 (75.0)	0.829
Stroke duration	24.50±11.63	29.83±11.74	0.257
Affected limb, non-dominant (%)	5 (35.7)	7 (58.3)	0.249
MFT	17.50±7.88	18.33±8.44	0.797
FMA	41.71±18.92	42.42±21.89	0.931
BBT	17.21±15.66	19.17±17.58	0.767
MMT (shoulder)	2.75±0.85	2.54±1.14	0.598
MMT (elbow)	2.75±0.87	2.67±1.17	0.837
MMT (wrist)	2.78±0.89	2.54±1.21	0.561
MBI	55.79±26.76	58.25±25.57	0.813

Mean±SD

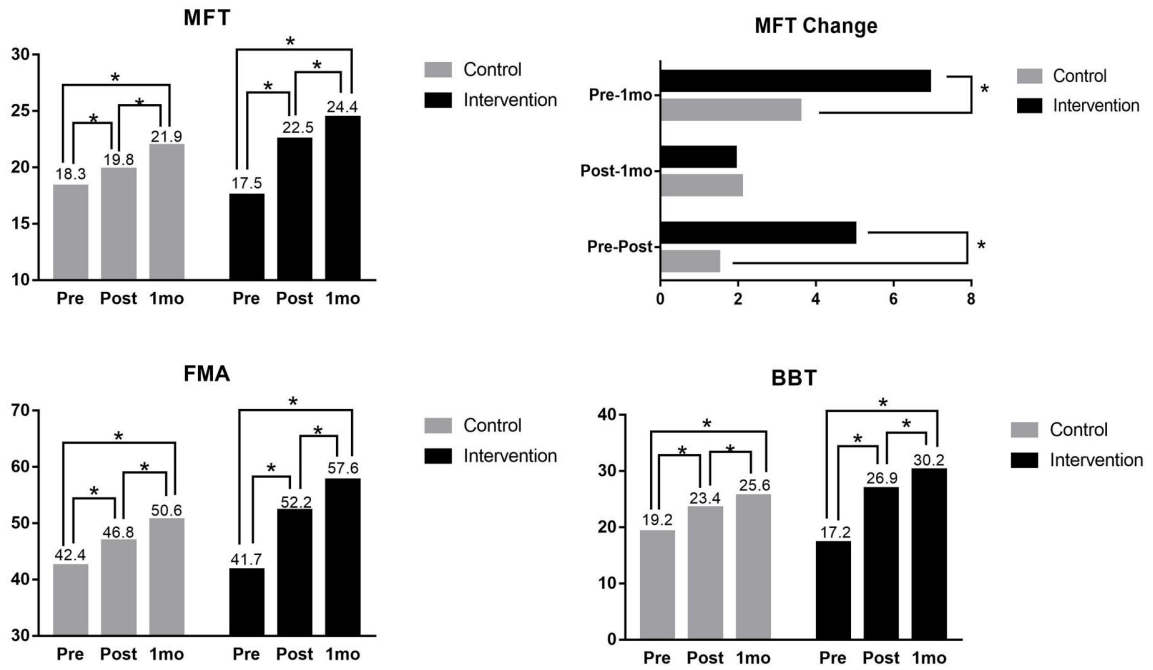


Figure 1. Change in the MFT, FMA, and BBT

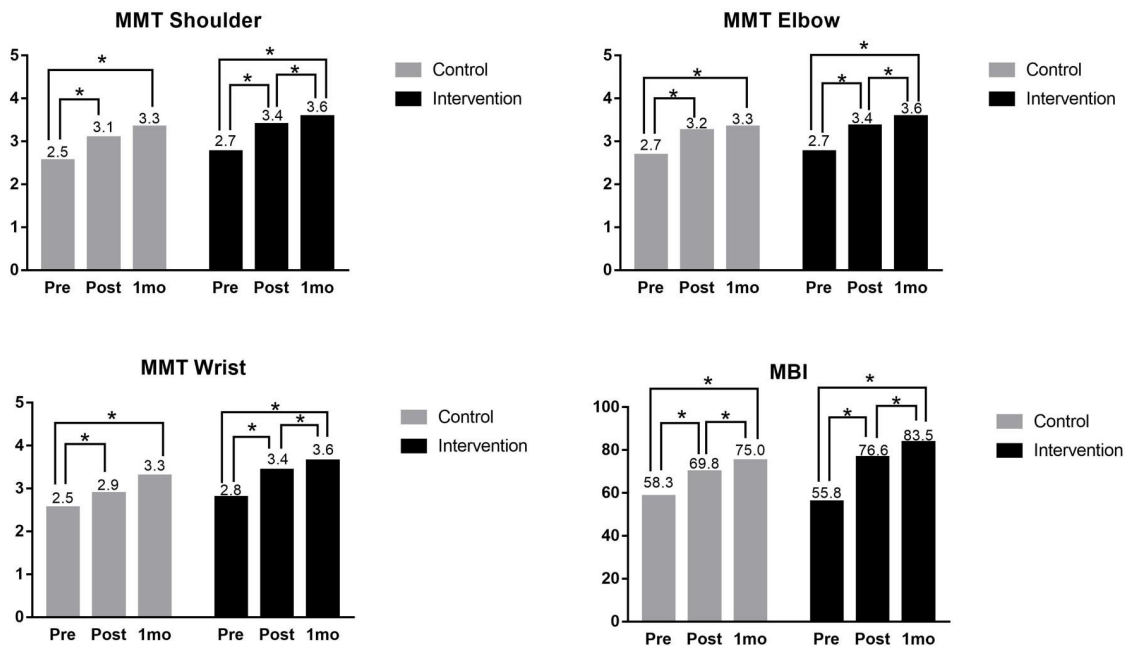


Figure 2. Change in the MMT (shoulder/elbow/wrist) and MBI