

The Effects of Rhythmic Auditory Stimulation Gait Training Combined with Haptic Feedback using Vibration on Gait in Stroke Patients : A randomized controlled trial

Su-Jin Kim¹, Sang-Hun Jang^{2*}

¹Department of Health and Medical Sciences, Graduate School,
Korea National University of Transportation

²Department of Physical Therapy, College of Health and Life Science,
Korea National University of Transportation

*Corresponding Author: upsh22@ut.ac.kr

진동 기반 햅틱피드백을 결합한 리듬 청각 자극 보행훈련이 뇌졸중 환자의 보행에 미치는 영향 : 무작위 대조 연구

김수진¹, 장상훈^{2*}

¹국립한국교통대학교 일반대학원 보건의료학과

²국립한국교통대학교 보건생명대학 물리치료학과

*교신저자: upsh22@ut.ac.kr

Abstract

This study presents preliminary findings on how the combination of rhythmic auditory cues and haptic feedback using vibration may influence single limb support during gait in individuals recovering from stroke.

1. Introduction

In the gait of stroke patients, the single limb support time tends to be shorter compared to the non-affected limb, and weight bearing is reduced of the affected limb. This study aims to investigate the effects of rhythmic auditory stimulation gait training combined with haptic feedback using vibration on the single limb support phase in stroke patients.

2. Method

Twelve stroke patients were randomly assigned to either the rhythmic auditory stimulation gait training with haptic feedback using vibration group(AHG, n=6, male: 4, female: 2) or the rhythmic auditory stimulation gait training group(AG, n=6, male: 2, female: 4), and all participants received interventions five times a week for four weeks, with each session lasting 30 minutes, consisting of a 3 minute warm up, 25 minutes of main gait training, and a 2 minute cool down. The AHG group

performed gait training in response to rhythmic auditory stimulation combined with real-time haptic feedback using vibration, while the AG group performed gait training in response to rhythmic auditory stimulation only. Gait parameters, including the single limb support phase and single limb support time, were measured using the GAITRite system.

3. Results

In the within group comparison of single limb support time, AHG group showed significant post improvements. In the between group comparison, the AHG group demonstrated significant difference in single limb support time changes from pre to post intervention($P<0.05$, Table 1).

4. Conclusion

This study confirmed that rhythmic auditory stimulation gait training combined with haptic feedback using vibration

showed a significant improvement in gait ability. To generalize the intervention effects, further randomized controlled trials including a larger sample size are warranted to compare pre and post intervention changes in gait parameters.

References

- [1] J. W. Seo, G. H. Kang, C. H. Kim, J. Jung, J. Kim, H. Kang, S. Lee, "Characteristics of gait event and muscle activation parameters of the lower limb on the affected side in patients with hemiplegia after stroke: A pilot study," Archives of Rehabilitation Research and Clinical Translation, pp. 100274, December, 2023.
- [2] T. Sanghan, T. Dissaneewate, S. Chatpun, "Gait asymmetry and foot regional analysis on spatiotemporal characteristics in stroke patients," in Proc. 2021 13th Biomedical Engineering International Conference (BMEiCON), pp. 1-4, November. 2021.

Acknowledgement: This was supported by Korea National University of Transportation in 2025.

[Table 1] The comparison of gait ability values between AHG group and AG group (n=12)

			AHG group (n=6)	AG group (n=6)	t	P
Gait parameter	Single limb support phase (%)	Pre	25.32±5.53	31.22±2.25	1.624	.135
		Post	27.87±4.29	31.48±3.40		
		change	2.55±1.19	0.27±1.84		
	Single limb support time (sec)	Pre	0.38±0.06	0.46±0.09	3.598	.005 ⁺
		Post	0.43±0.06	0.45±0.08		
		change	0.05±0.03 [*]	0.01±0.03		

Note. Values are expressed as mean±SD (%)

AHG group: Rhythmic auditory stimulation gait training combined with haptic feedback using vibration, AG group: Rhythmic auditory stimulation gait training.

* : significant differences between pre and post test, p<0.05

⁺ : significant differences for change value between two groups, p<0.05