Iran J Public Health, Vol. 51, No.10, Oct 2022, pp.2360-2361

Letter to the Editor

The Correlation between Proprioception and Postural Control in Healthy Adults

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(Received 10 Mar 2021; accepted 22 Mar 2021)

Dear Editor-in-Chief

Postural control is defined as recognizing changes in the external environment (e.g., ground slope, velocity of changes ground slope) and maintaining a static equilibrium state of the body through muscle contraction response (1). During postural control, the extension of the lower extremity muscle induced by external perturbation is collected through proprioceptors. The collected sensory information is transmitted to the central nervous system through the afferent pathway. Then the integration and regulation of the central nervous system level activates the efferent pathway, resulting in voluntary contraction of the muscles around the lower extremities (2, 3). The postural control leads to a link between proprioceptive sensory information input and voluntary muscle contraction and postural control, but the results of independent interpretation of proprioceptive sensation and lower extremity muscle function and simple comparative analysis of each element have been presented (4-6). These previous studies have limitations in explaining the relationship between the integrated proprioception and postural control.

Therefore, the purpose of this study was to identify the correlation between proprioception and postural control in healthy adults.

The participants in this study were 6 males and 9 females (22.40 ± 2.77 yr, 167.99 ± 7.71 cm, 60.24 ± 11.92 kg) with no history of musculoskeletal injury in the past 12 months. This study was approved by Konkuk University Ethical Committee (No. 7001355-202203-HR-520). The participants were worn an eye mask and headphones with noise cancelling function (Quietcomfort 35, Bose, USA) to block visual and auditory factors for maximum control of the afferent signals. The proprioception measurement using the customized tilting platform (torque: 7.2 Nm, rotation velocity: 2000 r/min, angle range: 0~5°, direction: anterior, posterior, left, right) was performed as follows (Fig. 1).

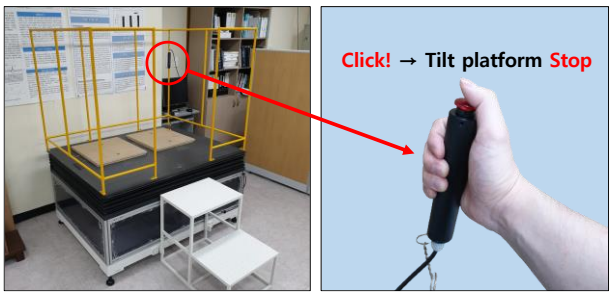

Fig. 1: Tilting Platform

1. After informing the participants that the slope of the tilting platform is in the range of 0 to 5°, it recognizes 2.5° which is the middle of the inclination.
2. Zero-set the inclination of the tilting platform to 0° and start tilting to 5°.
3. The participants stop the tilting platform by

pressing the stop button when the participants recognizes the 2.5° inclination provided in advance.

4. Calculation of the error score between the stopped inclination angle and the previously recognized 2.5°.

To measure postural control, the participants were performed one leg quiet standing on the force plate (OR6-7-1000, AMTI Inc., Watertown, USA; sampling rate: 1000 Hz) for 15 seconds. The Pearson's product-moment correlation coefficient was performed with regression analysis using SPSS 24 (Armonk, New York, USA). A level of significance was set to α=.05. As a result, the direction of posterior was negative correlation with moving length, moving AP range, moving area, moving ML velocity, and moving total velocity. The direction of right was negative correlation with moving length, moving AP range, moving ML range, moving area, moving ML velocity, and moving total velocity (Table 1).

Table 1: Results of Correlation between Proprioception and Postural Control

Direction		***Center of Pressure (One leg Quiet Standing)***						
		Moving Length [cm]	*Moving AP Range [cm]*	*Moving ML Range [cm]*	*Moving Area [cm²]*	*Moving ML Velocity [cm / s]*	*Moving AP Velocity [cm / s]*	*Moving Total Velocity [cm / s]*
Anterior	*r*	.125	.177	.264	.210	.184	.000	.125
	P	.656	.527	.341	.452	.512	1.000	.656
Left	*r*	-.306	-.402	-.245	-.438	-.437	-.005	-.305
	P	.268	.137	.379	.102	.103	.987	.268
Posterior	*r*	-.571*	-.644**	-.309	-.642**	-.671**	-.297	-.571*
	P	.026	.010	.263	.010	.006	.283	.026
Right	*r*	-.663**	-.781**	-.536*	-.796**	-.778**	-.326	-.663**
	P	.007	.001	.040	.000	.001	.235	.007

*P<.05, **P<.01

In summary, the posterior and right directions of proprioception was highly related to several center of pressure (CoP) variables through the one leg quiet standing and it was confirmed that proprioception is a determining factor in postural control.

Acknowledgements

The research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2021R1A6A3A13044836).

Conflict of interest

The authors declare that there is no conflict of interest.

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