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MEETING ABSTRACT Open Access

The effect of cognitive task on ankle movement variability in athletes with Functional Ankle Instability

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Background

Gait has been generally viewed as a largely automated motor task, requiring minimal higher-level cognitive input. Increasing evidence, however, suggest that attention demanding cognitive tasks to disturb gait [1,2]. Movement variability may influence joint stability and increase the risk of "giving way" at the ankle in individuals with functional ankle instability (FAI)[3]. The purpose of this study was to investigate the effect of dual-tasking on ankle movement variability in athletes with FAI.

Methods

21 athletes (age 25.57±4.77 years) with clinically diagnosed FAI were recruited. All participants completed 5 trials of normal walking and 5 trials of normal walking while performing a cognitive task. The cognitive task consisted of subtracting seven from a randomly selected number between 11 and 99 repeatedly whilst walking. Three dimensional rotations of the affected ankle (measured by an eight-camera motion capture system at 100 Hz) were calculated by visual3D during gait cycles. Between trials variability of ankle rotations time curves during stance phase and during 200ms before and after heel strike were calculated using the coefficient of multiple correlations (CMC) and intraclass correlation (ICC)

Results

The results indicate that mean CMC was decreased during dual task condition in the sagittal and frontal planes. This was statistically significant in frontal plane during 200ms before and after heel strike ($p<0.05$) (Table 1). There was reduction in ICC magnitude in dual-task condition compared to single task in 200ms before heel strike (Table 2).

Conclusion

The athletes with FAI demonstrated greater ankle movement variability during dual task condition which may indicate diminished neuromotor control. Cognitive load may increase episodes of ankle instability in these athletes.

Table 1 Mean CMC during different conditions and periods of time.

		Single-Task	Dual-Task
200ms before and after HS[a]	Frontal plane	0.9529±0.029	0.9270±0.044 *
	Sagittal plane	0.9505±0.042	0.9373±0.046
	Transverse plane	0.8530±0.150	0.8539±0.140
HS-TO[b]	Frontal plane	0.9396±0.042	0.91150.092
	Sagittal plane	0.9842±0.019	0.9825±0.022
	Transverse plane	0.9228±0.092	0.9274±0.072

[a] Heel strike. [b] Toe off. * P <0.05

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Table 2 ICC in 3planes during different conditions

		Single-Task	Dual-Task
200ms before HS [a]	Frontal plane	0.964	0.960
	Sagittal plane	0.943	0.710
	Transverse plane	0.934	0.914
HS	Frontal plane	0.968	0.975
	Sagittal plane	0.879	0.907
	Transverse plane	0.756	0.908
200ms after HS	Frontal plane	0.958	0.909
	Sagittal plane	0.950	0.949
	Transverse plane	0.809	0.973
TO [b]	Frontal plane	0.911	0.930
	Sagittal plane	0.882	0.898
	Transverse plane	0.924	0.903

[a] Heel strike. [b] Toe off. * P <0.05

Competing interests
Nester declares a personal commercial interest in the insoles tested in this study.

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References

1. Abbud GA, Li KZ, DeMont RG: **Attentional requirements of walking according to the gait phase and onset of auditory stimuli.** *Gait & posture* 2009, **30(2)**:227-32.
2. Al-Yahya E, Dawes H, Smith L, Dennis A, Howells K, Cockburn J: **Cognitive motor interference while walking: a systematic review and meta-analysis.** *Neuroscience and biobehavioral reviews* 2011, **35(3)**:715-28.
3. Brown CN, Padua DA, Marshall SW, Guskiewicz KM: **Variability of motion in individuals with mechanical or functional ankle instability during a stop jump maneuver.** In *Clinical biomechanics. Volume 24.* Bristol, Avon; 2009:(9):762-8.

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