



# THE EFFECT OF INSTRUCTIONS ON POSTURAL-SUPRAPOSTURAL INTERACTIONS IN THREE WORKING MEMORY TASKS

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## INTRODUCTION

- The costs of performing multiple tasks at once is well documented in a variety of populations.
- Often referred to as dual-tasking, these investigations record the performance in one or more concurrent tasks. In postural control research these are alternatively known as postural-suprapostural interactions.
- The results of these investigations in young adults often have mixed results, with some reporting improvements in postural control when performing a suprapostural task, some suggest deleterious effects to postural control, and some have reported no differences.
- In addition to the complexity of performing simultaneous tasks, externally provided instructions have been shown to alter performance of single tasks (e.g. “stand on the force platform as still as possible”).
- Moreover, suprapostural tasks that are given often employ different aspects of working memory.
- However, a systematic investigation of the effect of instructions has not been conducted to evaluate the role of attention among different domains of working memory.

## PURPOSE

- To determine the effects of explicit verbal instructions on postural-suprapostural task performance trade-offs.

## METHODS

- 22 physically active young adults (age: 22.2±5.1 years; height: 174.2±10.2 cm; mass: 72.2±15.6 kg) with a heterogeneous background of ankle injury history participated. In total, 45% of participants had a history of at least 1 lateral ankle sprain quantified by the Ankle Instability Instrument.

## METHODS

- 30-second single-limb balance trials were conducted under 4 Tasks:
  - Articulation: Subjects said a 1-syllable word per second in time with a metronome while maintaining single limb stance.
  - Counting backwards: Subject counted backwards from a random 3-digit number in multiples of 3 while maintaining single limb balance.
  - Manikin: Subjects identified the orientation of stick figure that underwent rotational manipulations while maintaining single limb balance.
  - Random number generation: Subjects produced a random digit (1-9) in time with a metronome (1Hz) while maintaining single limb stance.
- The Counting backwards, Manikin, and Random number generation tasks were each completed under three conditions:
  - No instructions, the subject was asked to balance while performing the task.
  - Postural task: Focus on remaining as still as possible.
  - Suprapostural task: Focus on maximizing suprapostural task performance.
- The primary outcomes were mean and standard deviation of time-to-boundary (TTB) scores in the anterior-posterior and medial-lateral direction.

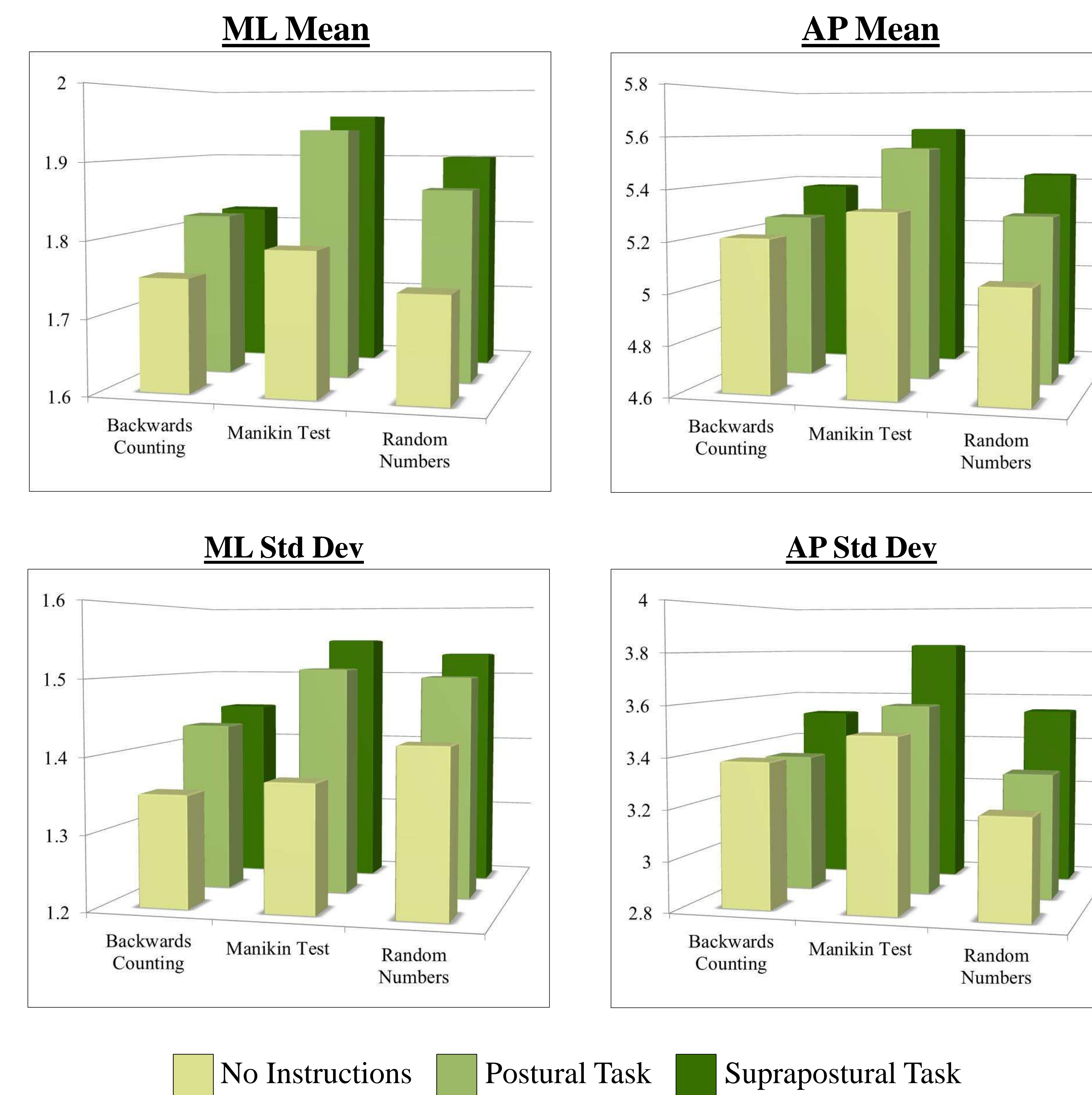
## RESULTS

- Postural control performance differed among Task ( $p=0.005$ ) in 3 of the 4 TTB variables and among instructions ( $p<0.001$ ) in all 4 TTB variables.

TTB Outcome	Conditions	Tasks					Instruction Means
		Baseline	Articulation	Backwards Counting	Manikin	Random Numbers	
ML Mean	NI			1.75±0.48	1.79±0.47	1.74±0.47	1.77±0.46
	BAL			1.82±0.49	1.94±0.45	1.86±0.53	1.87±0.47‡
	COG			1.82±0.47	1.96±0.49	1.90±0.48	1.89±0.47‡
	<b>Task Means</b>	1.78±0.47	1.63±0.43#	1.80±0.47	1.90±0.46*	1.84±0.48	
AP Mean	NI			5.21±1.81	5.32±1.68	5.05±1.77	5.19±1.73
	BAL			5.26±1.62	5.55±1.71	5.28±1.76	5.36±1.67‡
	COG			5.37±1.84	5.63±1.74	5.43±1.66	5.48±1.72‡,§
	<b>Task Means</b>	5.26±1.67	4.92±1.67#	5.28±1.74	5.50±1.70*	5.26±1.71	
ML Std Dev	NI			1.35±0.38	1.37±0.39	1.42±0.39	1.38±0.37
	BAL			1.43±0.42	1.51±0.40	1.50±0.48	1.48±0.41‡
	COG			1.45±0.38	1.55±0.39	1.53±0.38	1.51±0.36‡
	<b>Task Means</b>	1.45±0.40	1.28±0.36#	1.41±0.38	1.48±0.37	1.48±0.39*	
AP Std Dev	NI			3.38±1.21	3.49±0.98	3.20±1.14	3.36±1.07
	BAL			3.36±0.98	3.58±1.11	3.31±1.06	3.42±1.02
	COG			3.52±1.36	3.83±1.10	3.54±1.02	3.63±1.11‡,§
	<b>Task Means</b>	3.49±1.11	3.16±0.98#	3.42±1.15	3.63±1.03*	3.35±1.06†	

**Table 1:** TTB means and standard deviations by instructions and task. ML: medial-lateral, AP: anterior-posterior, NI: no instructions; BAL: instructions to focus on postural control task, COG: instructions to focus on suprapostural task. # Indicates a significant difference from the Baseline condition, \* Indicates a significant difference from Backwards Counting task, † Indicates a significant difference from the Manikin task; ‡ Indicates a significant difference from the No Instructions condition, § Indicates a significant difference from the Balance Instructions condition.

## RESULTS

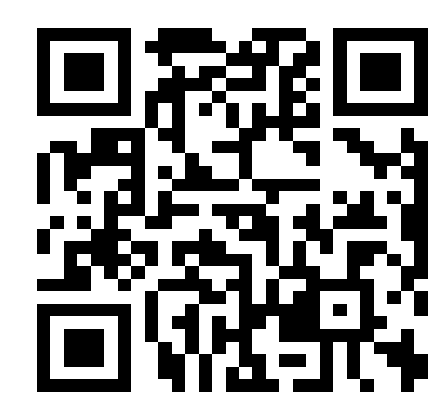


## CONCLUSIONS

- The effects of performing a suprapostural task appear to improve the performance of the concurrent postural task, suggesting less attention directed towards postural control may be beneficial.
- It appears that any type of explicit verbal instruction during dual-tasking leads to improvements in postural control.

## ACKNOWLEDGEMENTS

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