ASSESSING THE IMPACT OF VERBAL INSTRUCTION ON COUNTERMOVEMENT JUMP PERFORMANCE

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Key Findings

1. No significant differences in jump height or impulse were detected between the three instructions. However, significant differences in strategy metrics were observed.
2. The instruction emphasizing maximal height and the neutral instruction elicit similar results, while the instruction emphasizing a fast jump execution completely alters all underlying strategy metrics.
3. When using the CMJ as an assessment tool, verbal instruction should be kept consistent, even when assessing athletes that jump repetitively and employ a unique strategy reflective of the demands of their sport.

BACKGROUND & PURPOSE

The countermovement jump (CMJ) is often used to monitor athletes' performance through the interpretation of metrics derived through force plate data collection, and recent advances in technology now allow technicians of all experience levels to easily collect data. This may introduce procedural variation, such as verbal instruction. The purpose of this study was to examine differences in CMJ performance through identifying shifts in outcome metrics and underlying strategy metrics when given different verbal instructions. Athletes involved in a jumping orientated sport were of specific interest due to the inherent force-time signature they may display.

METHODS

Participants

12 Division I female collegiate volleyball players (age: 19.25 ± 1.06 yrs; height: 178.9 ± 8.6 cm; body mass: 72.9 ± 11.3 kg; BMI: 22.69 ± 2.49 kg/m^2). Of the 12 athletes, 4 were outside hitters (33%), 4 were middle blockers (33%), 3 were liberos (25%), and 1 was a setter (9%).

Experimental Procedures

Three CMJs under three different verbal instruction conditions were performed, totaling nine jumps, on a portable force platform sampling rate of 1000 Hz. A dowel rod was held across the upper back to limit the influence of an arm swing. The three verbal instructions that were used included: **'Jump as high as possible'**; **'Jump as fast as possible'**; and **'Jump to the best of your ability'**. All trials within the given condition were completed prior to the onset of the next condition. Each instruction was repeated before each jump was performed, and the order in which the instructions were administered to each subject was randomized to avoid a possible order effect.

Data and Statistical Analysis

All raw data was exported and analyzed using a custom Matlab script to calculate calculated for each metric. The metrics of interest included JH, time to take-off (TTTO), RSIm, propulsive duration, braking duration, mean braking force, mean propulsive force, propulsive impulse, braking impulse, and countermovement depth. Effects of condition (i.e., verbal instruction) were evaluated using repeated measures with Bonferroni corrections for multiple comparisons. Effect sizes for the omnibus models are presented as partial eta squared (η_p^2) and as Cohen's D for post hoc comparisons .

RESULTS

Table 1. CMJ Performance Across Different Verbal Cues

	High	Fast	Neutral
Jump Height (m)	0.281±0.029	0.276±0.033	0.283±0.030
Time to take-off (ms)	901.4±154.9[1]	734.0±114.0[1,2]	859.1±116.2[2]
Reactive Strength Index Modified	0.324±0.064[1]	0.389±0.080[1,2]	0.336±0.057[2]
Propulsive Duration (ms)	301.4±36.48[1]	243.6±52.40[1,2]	291.9±37.14[2]
Braking Duration (ms)	181.2±30.51[1]	141.8±29.78[1,2]	176.6±30.90[2]
Mean Propulsive Force (N)	567.3±78.34[1]	709.9±135.8[1,2]	585.0±61.06[2]
Mean Braking Force (N)	518.7±135.5[1]	614.7±108.6[1,2]	509.0±126.9[2]
Propulsive Impulse (N/s)	170.5±26.94	168.7±28.31	170.7±27.07
Braking Impulse (N/s)	90.83±17.98	86.16±21.37	86.64±15.25
Countermovement Depth (m)	0.329±0.049[1]	0.252±0.065[1,2]	0.316±0.049[2]

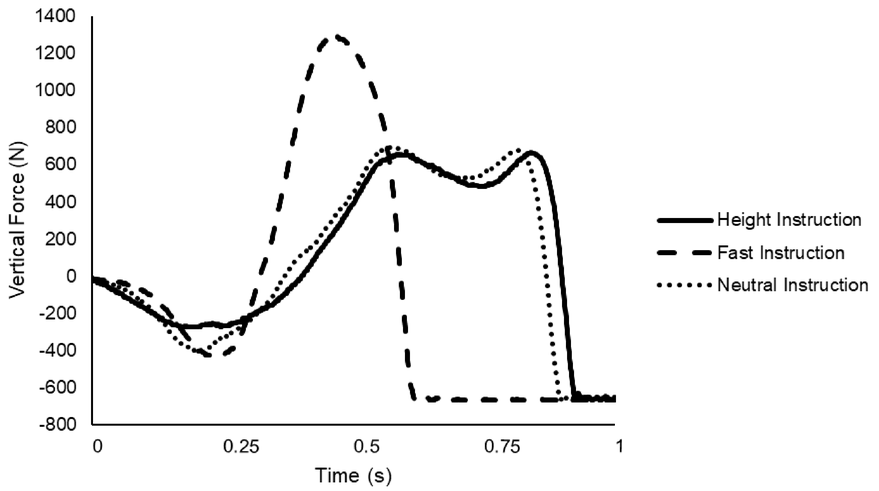
Data is presented as mean ± standard deviation. [1]Denotes a significant difference between the height and instruction ($p<0.05$). [2]Denotes a significant difference between the fast and the neutral instruction ($p<0.05$)

Table 2. Post-hoc Pairwise Comparisons

	High vs. Fast	Fast vs. Neutral
	p-value, ES	p-value, ES
Reactive Strength Index Modified	0.003, 0.90	0.006, 0.75
Time to Take Off (ms)	0.005, -1.23	<0.001, -1.09
Propulsive Duration (ms)	0.002, -1.28	<0.001, 1.06
Braking Duration (ms)	0.003, -1.30	0.002, -1.14
Mean Propulsive Force (N)	0.005, 1.29	0.006, 1.19
Mean Braking Force (N)	0.018, 0.78	0.022, 0.90
Countermovement Depth (m)	0.002, 1.45	0.002, 1.27

Note: Effect sizes are displayed as Cohen's D. ES – Effect size

Figure 1. Example of force-time curve for a representative subject



CONCLUSIONS & PRACTICAL APPLICATIONS

While outcome measures did not significantly change through varying the instruction, the strategy of how the athletes reached the outcomes did show significant change. **PRACTICAL APPLICATIONS:** CMJs are commonly used to provide insight into athletes' performance status. Common practice has recently shifted from prioritizing jump height to examining the force-time strategy used to achieve jump height. This is due to the inferences that can be made through the corresponding metrics. The results of the present study suggest that these underlying metrics can be manipulated by the instructions given. Thus, practitioners should proceed with caution when giving instructions during a CMJ assessment.