A COMPARISON OF COUNTERMOVEMENT JUMP VARIABLES BETWEEN SINGLE SPORT AND MULTIPLE SPORT YOUTH ATHLETES

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INTRODUCTION

Young athletes participating in a single sport may have higher rates of drop out and injury. Although, researchers have not examined the performance differences between adolescent athletes that participate in one sport versus those that participate in multiple sports.

PURPOSE: The aim of this study was to determine if there were differences in countermovement jump (CMJ) performance in adolescent athletes participating in a single sport or multiple sports.

METHODS

Subjects (Table 1) performed 3 CMJs on a force plate, with data subsequently analyzed in Excel, using a forward dynamics approach. After a 3-minute warm up on a cycle ergometer and 5-minute lower limb dynamic stretch the subjects completed 3 CMJs (with 30-seconds between each jump). Subjects stood still on the force plate for one second so that the subject's weight could be recorded and to ensure accurate measurements for the movement onset. Subjects were instructed to place their hands on the hips throughout the movement. The subjects were also instructed to jump as high as possible during each attempt. The variables of interest were consistent with previous work from McMahon et al. (2017) and included jump height, peak and mean propulsive power, propulsion impulse, propulsion mean and peak force, braking mean and peak force. If the variable for both single and multiple sport was found to be normally distributed an independent samples t-test was performed, if either or both variables were found to be not normally distributed the Mann-Whitney non-parametric test was performed ($p < 0.05$). Hedges *g* effect sizes were calculated using estimation stats to determine the magnitude of any differences and interpreted as (< 0.19), small (0.20 – 0.59), moderate (0.60 – 1.19), large (1.20 – 1.99), and very large (2.0 – 4.0). To account for the family-wise error rates once the *p*-value was calculated the Bonferroni correction was applied by multiplying the *p*-value by the number of variables for each test (4 for anthropometric data and 8 for CMJ).

Table 1: Comparison of Anthropometric Data Between Single Sport and Multiple Sport Youth Athletes Post-PHV

Variable	Single Sport (n =13)	Multi-Sport (n = 40)	p	Hedges' g (95% CI)
Height (m)	173.1 ± 8.3	167.7 ± 7.1	1.000	-0.71 (-1.47, -0.04)
Mass (kg)	62.6 ± 7.1	61.6 ± 9.5	1.000	-0.11 (-0.72, 0.39)
Age at Testing	16.4 ± 1.4	15.8 ± 1.5	0.189	0.45 (-0.15, 1.01)
Age at PHV (yrs)	14.1 ± 1.3	13.0 ± 1.0	0.002	-0.97 (-1.70, -0.20)
Maturity offset (yrs)	2.4 ± 0.8	2.8 ± 0.8	0.328	0.46 (-0.43, 0.97)

RESULTS

CMJ height, relative mean propulsion power and relative propulsive impulse were significantly ($p < 0.05$) and moderately ($g > 0.60$) greater in single sport athletes compared to multiple sport athletes. In contrast, relative peak propulsion power, relative mean braking force and relative peak braking force were not significantly different ($p > 0.05$) between groups, although the single sport athletes performed better, and of a moderately to large magnitude ($g = 0.654$-1.03), compared to the multi-sport athletes. Relative mean and peak propulsion force were not significantly or meaningfully different between groups ($p > 0.05$; $g < 0.60$).

Table 2: Comparisons of countermovement jump performance between single sport and multi-sport post-PHV adolescent athletes

Variable	Single Sport	Multi-Sport	p	Hedges' *g* (95% CI)
Jump Height (m)*	0.33 ± 0.08	0.24 ± 0.07	0.024	-1.14 (-2.01,-0.30)
Mean Propulsion Power (W·kg^{-1})	26.7 ± 7.1	21.8 ± 4.0	0.040	-0.984 (-1.84,-0.20)
Peak Propulsion Power (W·kg^{-1})*	49.7 ± 10.6	41.4 ± 6.9	0.104	-1.03 (-1.88,-0.25)
Propulsive Impulse (Ns·kg^{-1})*	2.5 ± 0.3	2.2 ± 0.3	0.024	-1.14 (-1.93,-0.31)
Mean Propulsion Force (N·kg^{-1})	19.0 ± 3.8	17.9 ± 1.8	0.184	-0.472 (-1.35,0.24)
Peak Propulsion Force (N·kg^{-1})*	23.2 ± 4.1	21.9 ± 2.5	1.000	-0.428 (-1.29,0.24)
Mean Braking Force (N·kg^{-1})	15.8 ± 2.5	14.5 ± 1.7	1.000	-0.654 (-1.40,-0.01)
Peak Braking Force (N·kg^{-1})	21.7 ± 4.2	19.4 ± 2.6	0.608	-0.746 (-1.55,-0.02)

*Mann-Whitney Non-Parametric Analysis

Green = Significant & Meaningful; Yellow = Meaningful but not Significant; Red = Not Significant or Meaningful

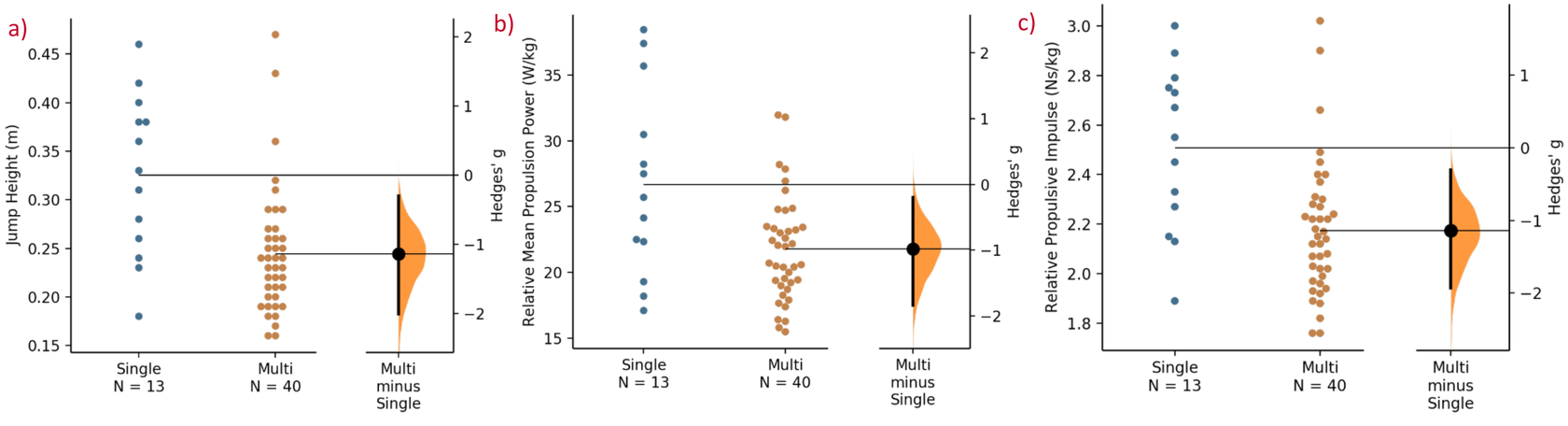

Figure 1: Comparisons of Countermovement Jump Variables between Groups: a) Jump Height, b) Relative Mean Propulsion Power, c) Relative Propulsion Impulse

CONCLUSIONS

Single sport athletes that are post - peak height velocity possess superior countermovement jump outputs than the multi-sport athletes with the same maturity status. Therefore, based on these results multi-sport athletes need to ensure they are participating in appropriate and adequate strength and conditioning to support the demands of participating in multiple sports.

PRACTICAL APPLICATION

Practitioners and researchers should be aware that single sport athletes outperform multi-sport athletes (post-PHV) when performing the CMJ. Therefore, based on the results of this study it is shown that early sport specialization in a single sport may result in greater CMJ performance compared to the multiple sport athletes.

REFERENCES

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