RELATIONSHIPS BETWEEN INTERNAL AND EXTERNAL WORKLOAD AND DIFFERENCES BETWEEN MEN AND WOMEN COLLEGIATE VOLLEYBALL ATHLETES

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BACKGROUND

- Habitual exposure to repetitive, high-intensity movements is commonplace in volleyball (VB).
- Positive associations exist between metrics of internal and external workload in various sport contexts, yet limited data exist relative to VB.
- Sex differences in the physiological and mechanical profiles across collegiate VB may also exist, with the potential for distinct differences in training volume, match demands, and agreement between internal and external workload.

PURPOSE

- To examine differences in internal and external workload and subsequent associations between men and women collegiate VB athletes

METHODS

- National Collegiate Athletic Association Division I athletes from the men's (MVB, n = 16) and women's (WVB, n = 17) teams participated.
- Height and body composition were assessed using a stadiometer and air displacement plethysmography, respectively.
- Athletes wore the same assigned inertial measurement unit during every practice (MVB, n = 20 practices; WVB, n = 30 practices) and match (MVB, n = 18 matches; WVB, n = 16 matches) across a competitive season to capture surrogate measures of external workload (JUMPS) and internal workload (sRPE = RPE x DUR).
- Pearson's correlation coefficient (r) and repeated measures correlations (rmcorr) to assess between and within-subject associations, respectively.
- Independent samples t-test was used to determine sex differences in external and internal workload for match, training, and total sessions.
- Significance was set to $p \leq 0.05$.

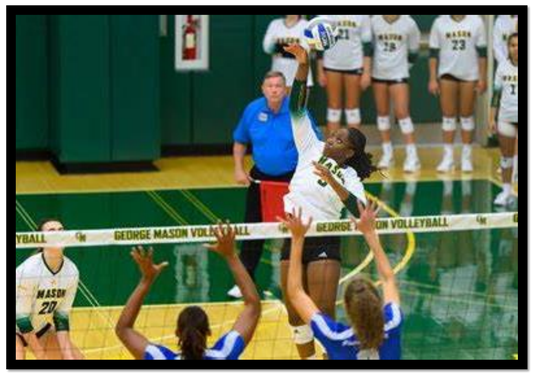
KEY FINDINGS

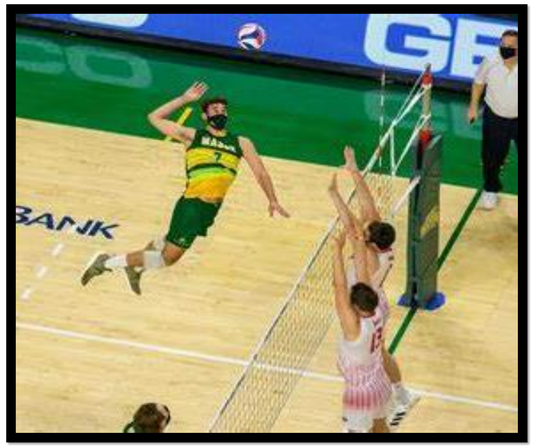
- **Women collegiate volleyball athletes recorded higher external and internal workloads during practice compared to MVB athletes, but not during matches.**
- ***Moderate* to *very large* associations were found between jump count and sRPE within and between men and women collegiate volleyball athletes.**

Table 1. Gender Differences in Descriptives, Workloads, and Correlations

	Variable	Event Type	Men	Women	Diff.
Descriptives	Age (years)		20.31 ± 1.12	20.26 ± 1.13	0.05
	Height (cm)		194.15 ± 6.88	179.59 ± 3.98	**14.56***
	Body Mass (kg)		84.35 ± 8.48	76.10 ± 7.05	**8.25***
	BF%		12.67 ± 4.94	28.15 ± 4.34	**-15.48***
Workloads	JUMPS	All	87.52 ± 52.21	111.62 ± 68.38	-24.10
		Practice	101.69 ± 49.21	130.22 ± 67.29	**-28.93***
		Match	70.19 ± 50.61	67.22 ± 47.33	2.97
	sRPE (AU)	All	451.82 ± 267.69	509.16 ± 327.58	-57.34
		Practice	495.01 ± 225.74	573.70 ± 283.70	**-78.69***
		Match	398.99 ± 303.67	355.11 ± 371.73	43.88
Correlations	*r*	All	0.57, *large*, $p = 0.02$	0.47, *moderate*, $p = 0.06$	0.10
		Practice	0.54, *large*, $p = 0.03$	0.60, *large*, $p = 0.01$	-0.04
		Match	0.70, *large*, $p = 0.002$	0.74, *very large*, $p < 0.001$	-0.04
	rmcorr	All	0.69, *large*, $p < 0.001$	0.77, *very large*, $p < 0.001$	-0.08
		Practice	0.57, *large*, $p < 0.001$	0.64, *large*, $p < 0.001$	-0.07
		Match	0.74, *very large*, $p < 0.001$	0.62, *large*, $p < 0.001$	0.12

Note: All data reported as mean ± standard deviation; AU = arbitrary units; r = Pearson's correlation coefficient; rmcorr = repeated measures correlation coefficient * p-value associated with significant difference ($p \leq 0.05$) compared to men; (-) Diff. value represents higher value for women compared to men





RESULTS

- MVB displayed greater height ($p<0.001$) and body mass ($p = 0.03$)
- WVB displayed a greater body fat percentage ($p<0.001$).
- In practice only, WVB performed more jumps ($p=0.04$) and reported a higher sRPE ($p=0.01$) compared to MVB.
- No differences existed in match workloads between MVB and WVB.
- Moderate to very large associations were exhibited between JUMPS and sRPE across event type and gender (Table 1).

CONCLUSIONS and PRACTICAL APPLICATIONS

- Differences existed in internal and external workloads in practice with WVB performing higher practice loads.
- Positive associations existed between internal and external load in MVB and WVB.
- In order for load monitoring strategies to be effective the inclusion of jump count and sRPE is recommended.
- Exposure to workload varies between collegiate MVB and WVB; therefore, sex-specific workload management strategies are warranted.