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Relationship between Hydration and Jump Performance: Differences Between Elite and Regional Young Basketball Players

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Introduction

Hydration has been classically associated with aerobic performance (Maughan, 2012). However, less is known about the relationship between anaerobic performance and hydration parameters (Kraft et al. 2012). A classical study by Sjogaard (1982) suggested that fast-switch muscle fibers have a higher hydration than slow-switch. So, a possible association between fast movements and intracellular hydration/water (ICW) could be possible.

Bioelectrical impedance analysis (BIA) is a technique commonly used in sport settings, which allow us to estimate accurately total body water (TBW) and ICW. Thus, BIA offer the possibility to explore the association between jump performance and ICW in a whole-body approach.

Objective

It was our aim to analyze the association between jump performance and TBW or ICW.

Material and Methods

- Two teams from the metropolitan area of Málagawere assessed (elite level (T1, n=11): age, 17.45 ±1.5years; height, 198.6±9.7cm; regional level (T2, n=10): age, 15.30 ±1.2years; height, 179.0 ±5.3cm; table 1).
- T1 players were involved in professional or national competitions, whereas T2 participated in Adalucian leagues.
- A classical BIA procedure (Lukaski, 1988) was the alternative method to estimated TBW (MediSystem®, Spain). All body composition assessment were performed in fasting conditions.
- Dual-energy X-ray absortiometry (DXA) was used to estimate fat free mass (FFM), fat mass percent (FMP) and limbs soft lean tissue ($Limbs_{FFM}$). Skeletal muscle mass (SMM, Kim et al. 2006), FFM hydration (FFM_{Hidr}) and body cell mass (BCM) were calculated.
- Countermovement jump (CMJ) and CMJ with free arms (CMJA) were measured with jump map.
- Partial correlation analyses adjusted to$Limbs_{FFM}$between jump and hydration variables were carried out. Differences between teams were also analyzed by independent sample T-test. A P value less than 0.05 was used to accept or refuse our hypothesis.

Results

- Large differences in body composition were observed between T1 and T2 (table 1).
- A strong association was observed between CMJA, CMJ and ICW (figure 1); however, this correlation was only signifcant for CMJ after adjust to FFMh and LSLT (r= 0.705, *P<0.01*).
- As expected, significant differences were found between T1 and T2 for CMJ (6.77 ±2.22cm; *P<0.01*) and CMJA (15.41 ±2.18cm; *P<0.001*); however, ICW was the only hydration variable significantly different among level groups (61.14 ±0.81% vs. 59.48 ±1.29%; *P<0.01*) (table 1).

Table 1. Sample characteristics. Differences between elite and regional level players.

Variables		Regional (n=10)				Elite (n=11)				T-test
		Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Sig.
Age	*(Years)*	15.30 ± 1.16		14.00	18.00	17.45 ± 1.51		16.00	21.00	**
Height	*(cm)*	179.0 ± 5.3		168.0	186.0	198.6 ± 9.7		180.8	208.9	***
Weight	*(Kg)*	63.34 ± 11.38		47.73	82.40	86.97 ± 8.89		75.28	101.95	***
FMP	*(%)*	12.30 ± 3.01		8.50	17.00	11.40 ± 2.06		8.30	15.10	
FFM	*(Kg)*	55.36 ± 8.93		41.20	69.40	77.00 ± 7.41		66.60	87.80	***
$Limbs_{FFM}$	*(Kg)*	25.93 ± 3.74		20.00	31.90	36.63 ± 4.60		30.30	43.40	***
SMM	*(Kg)*	30.58 ± 4.25		23.90	37.40	42.62 ± 5.20		35.40	50.30	***
SMMI	*(Kg/m^2)*	9.52 ± 1.17		8.45	11.66	10.77 ± 0.66		9.63	11.52	*
TBW	*(%)*	64.63 ± 2.96		60.60	71.20	62.91 ± 3.13		57.20	68.90	
ICW	*(%)*	59.48 ± 1.29		58.00	62.30	61.14 ± 0.81		59.90	62.60	**
ECW	*(%)*	40.52 ± 1.29		37.70	42.00	38.86 ± 0.81		37.40	40.10	**
FFM_{Hidr}	*(L/Kg)*	0.74 ± 0.03		0.70	0.79	0.72 ± 0.03		0.67	0.76	
BCM	*(Kg)*	37.12 ± 6.71		26.70	47.70	52.93 ± 5.21		45.80	60.40	***

FMP, fat mass percent; FFM, fat free mass; $Limbs_{FFM}$; limbs soft lean tissue; SMM, skeletal muscle mass; SMMI, SMM index; TBW,total body water; intracellular hydration/water (ICW); extracellular hydration/water (ECW); FFM_{Hidr};FFM hydration; body cell mass (BCM).
Sig., statistical significance. *, **, ***; P<0.05, P<0.01 and P<0.001, respectively.

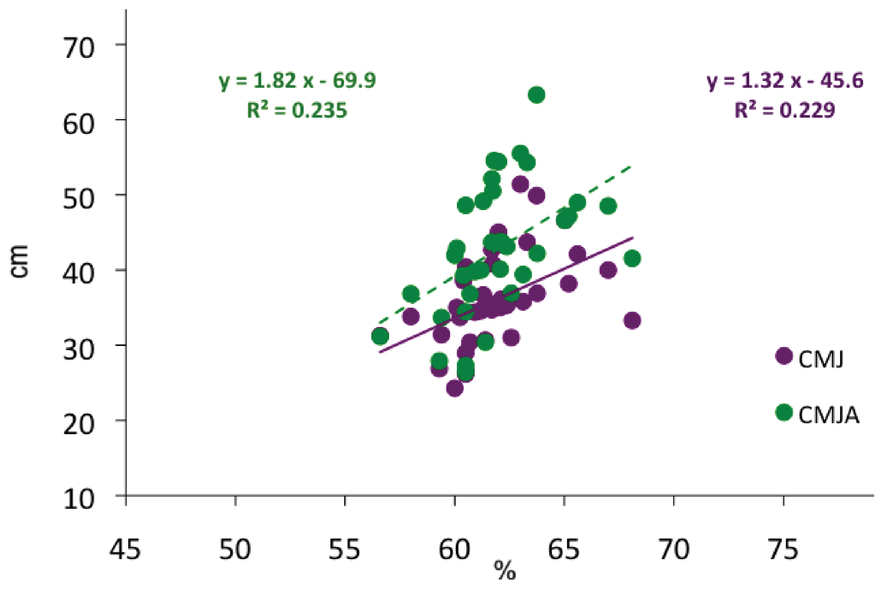

Figure 1. Scatter plot between percent of intracellular hydration and jump performance. CMJ (countermovement jump) CMJA (countermovement jump with arm swing).

Discussion

Our findings suggest that ICW must be explanatory mechanism for jump capacity, mainly when less coordinative skills are involved. Differences between jump performances among levels of competition could be partially explained by ICW. Our body composition data are in accordance with the Battistini's study (1994), who reported significant differences among athletes of different level. Nevertheless, our results can be biased by the difference of age between samples. More research with larger samples is necessary to confirm our results.

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