

Height as a talent promotion factor in women's volleyball. Analysis of the World Grand Prix 2004-2012

La talla como un factor de promoción del talento en el voleibol femenino. Análisis del Grand Prix Mundial 2004-2012

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Abstract

Height is a core factor for talent promotion in volleyball, but we question if its supremacy should be observed in training programs for elite-level women's volleyball. Our purpose was to analyze the height of women volleyball players participating in the World Grand Prix (WGP) and to retrieve information relevant for characterizing the elite-level volleyball and to inform talent promotion programs. We analyzed 2074 players participating in the WGP from 2004 to 2012. Descriptive statistics were calculated. One-way ANOVA was used to verify the existence of differences in height according to ranking. Post-hoc testing was conducted using the Scheffé test. A significance level of .05 was established. The players' average height was 182.5 ± 7.6 cm. From 2008 to 2012, between 1 and 2% of the participants were under 160 cm. Differences existed between the rankings with respect to average height ($F_3=15.125$, $p \leq 0.001$, $\eta^2 p=0.021$). Teams classified in the first four spots of the competition presented an average height that was significantly superior to that found for the remaining teams. Height is a relevant factor for achieving elite-level women's volleyball. However, there is evidence that shorter players still have an important role to play at this level. Shorter players may be relevant for enhancing the quality of training sessions and on performing specific tasks during preparation; hence, they might be decisive in potentiating the quality of the players that actually get to enter the court.

Keywords: Talent promotion. Performance analysis. Height. Volleyball.

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1. Introduction

In sports, there is considerable interest in the early identification of the characteristics of talent, promoting a selection of the players that are best fitted to achieve elite-level sport^{1,2,3}. This implies knowing which factors present greater weight for future success in a given sport^{4,5}. According to Abbott and Collins⁶, those factors should present a stable and predictable development with time; otherwise, any effort to proceed to talent promotion based on those factors would result ineffective. In volleyball, height is usually included as a main factor of talent⁷, as it usually is a stable measure and allows differentiating those attaining high-level and those not achieves such elite-level performances.

Indeed, height is usually considered one of the core factors for achieving elite-level performance in volleyball^{8,9}, and a development profile above the average may be an indicator of sports talent¹⁰. In fact, in under-17 girl Brazilian players, height was the main morphological determinant to achieve elite level performance, while somatotype and vertical

jump ability did not allow distinguishing between athletes from the national team and from a state team¹. At the elite level, the Cuban women teams competing in the Olympic Games in 1992, 1996 and 2000 showed an average height of 181.6 cm⁷. Analyzing women volleyball players from the Greek National League A1 (n=79) and A2 (n=84) divisions, Malousaris et al.⁸ found a body height ranging from 161 cm to 194 cm, with a mean value of 177.1±6.5 cm. The A1 players (179.6±5.8 cm) were significantly taller than the A2 players (174.7±6.2 cm), in average 4.9 cm. And a trend towards increasing height has been verified in men's volleyball¹¹.

Therefore, although the concept of talent relies on multiple factors and presents enormous complexity of analysis, advising caution when using uni-dimensional models^{2,6,12,13}, height seems to emerge as a somewhat nuclear concept for talent in volleyball. In their review paper, Lidor and Ziv¹⁴ found that young female volleyball players already tend to be taller, in average, than their peers in the standard population; furthermore, they seem to be taller than athletes from many other sports. The authors concluded that in female adolescent players, height was correlated to game performance. Analyzing girls from the Brazilian under-17 national volleyball team, Cabral et al.¹ reported an average height of 181.6±6.1 cm. In the same study, players from the state team of Rio Grande do Norte were, in average, 170.5±8.0 cm tall. This difference hints that height might be differentially weighted according to the level of practice.

Our purpose was to analyze the height of women volleyball players participating in the World Grand Prix (WGP) and to retrieve information relevant for characterizing the elite-level volleyball, and also to inform talent promotion programs. The WGP is a major international volleyball competition for women. It is held each year and only the best world-level national teams are allowed to participate. Therefore, this competition is representative of women's elite-level volleyball.

2. Methods

We analyzed the height of women volleyball players who have participated in the FIVB (Fédération Internationale de Volley-Ball) WGP from 2004 to 2012. Data were collected from the FIVB online platform (www.fivb.org), including values from a total of 2074 participants. The National Teams afford the FIVB with such information, and height is measured standing without any footwear. Each team presents a minimum of twelve and a maximum of twenty players in the roster. Descriptive statistics were calculated, both in absolute terms and also per year and classification. Teams were divided into four groups according to their ranking in the competition: 1st to 4th ranked teams in group one, 5th to 8th in group two, 9th to 12th in group three, and 13th to 16th in group four. It should be noted that group four only exists

since 2011, when the competition was extended to sixteen teams; before 2011, only twelve teams were granted access to this competition. One-way ANOVA was used to verify the existence of differences in height according to ranking. Post-hoc testing was conducted using the Scheffé test. A significance level of .05 was established.

3. Results

The players' average height was 182.5 ± 7.6 cm, with a minimum registered height of 155 cm and a maximum of 204 cm. Table 1 presents the average height (mean \pm SD) across the years:

Table 1. Average height (mean \pm SD) per year

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Height (cm)	182.6 ± 7.2	182.8 ± 6.9	183.0 ± 7.4	183.5 ± 7.4	182.9 ± 7.4	182.4 ± 7.9	182.2 ± 7.7	181.9 ± 8.0	182.0 ± 7.9

Figure 1 provides a visual picture of the evolution of height from 2004 to 2012.

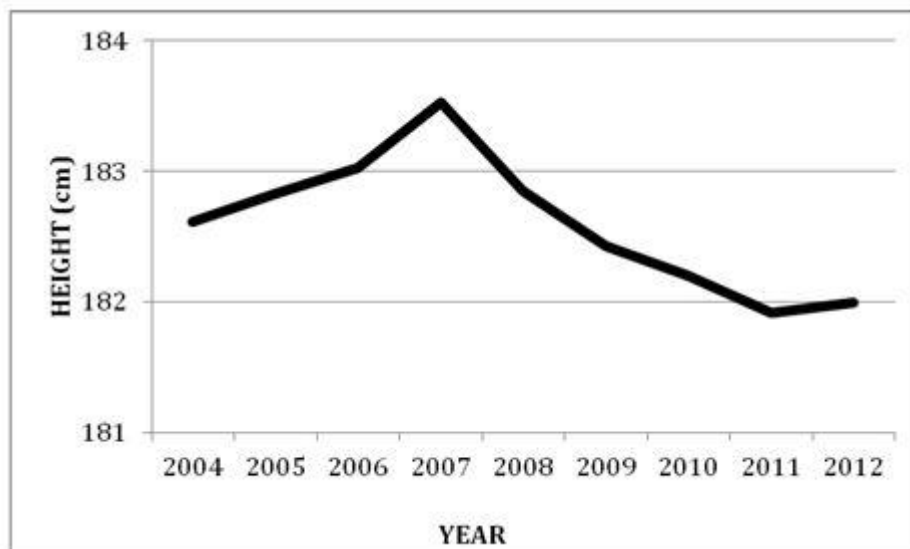


Figure 1. Evolution of the mean height of women volleyball players in the World Grand Prix from 2004 to 2012

Overall, height has been maintaining a steady state between around 182 cm and 183.5 cm. In table 2, data concerning the distribution of height categories across the years is presented, both in absolute values and in percentage.

Table 2. Distribution of height (cm) across the years

	<i>≤160</i>	<i>161-165</i>	<i>166-170</i>	<i>171-175</i>	<i>176-180</i>	<i>181-185</i>	<i>186-190</i>	<i>191-195</i>	<i>196-200</i>	<i>>201</i>	<i>Total</i>
2004	2	3	8	15	55	56	47	20	5	1	212
%	<i>0,9</i>	<i>1,4</i>	<i>3,8</i>	<i>7,1</i>	<i>25,9</i>	<i>26,4</i>	<i>22,2</i>	<i>9,4</i>	<i>2,4</i>	<i>0,5</i>	
2005	0	0	7	12	30	29	30	17	2	0	127
%	<i>0,0</i>	<i>0,0</i>	<i>5,5</i>	<i>9,5</i>	<i>23,6</i>	<i>22,8</i>	<i>23,6</i>	<i>13,4</i>	<i>1,6</i>	<i>0,0</i>	
2006	0	1	12	16	43	45	46	19	7	2	191
%	<i>0,0</i>	<i>0,5</i>	<i>6,3</i>	<i>8,4</i>	<i>22,5</i>	<i>23,6</i>	<i>24,1</i>	<i>10,0</i>	<i>3,7</i>	<i>1,1</i>	
2007	1	0	13	14	37	56	44	24	7	2	198
%	<i>0,5</i>	<i>0,0</i>	<i>6,6</i>	<i>7,1</i>	<i>18,7</i>	<i>28,3</i>	<i>22,2</i>	<i>12,1</i>	<i>3,5</i>	<i>1,0</i>	
2008	3	0	15	14	43	60	55	18	8	0	216
%	<i>1,4</i>	<i>0,0</i>	<i>6,9</i>	<i>6,5</i>	<i>19,9</i>	<i>27,8</i>	<i>25,5</i>	<i>8,3</i>	<i>3,7</i>	<i>0,0</i>	
2009	3	2	15	23	46	50	60	24	2	2	227
%	<i>1,3</i>	<i>0,9</i>	<i>6,6</i>	<i>10,1</i>	<i>20,3</i>	<i>22,0</i>	<i>26,4</i>	<i>10,6</i>	<i>0,9</i>	<i>0,9</i>	
2010	3	0	15	27	40	56	47	26	5	0	219
%	<i>1,4</i>	<i>0,0</i>	<i>6,9</i>	<i>12,3</i>	<i>18,3</i>	<i>25,6</i>	<i>21,5</i>	<i>11,9</i>	<i>2,3</i>	<i>0,0</i>	
2011	5	3	25	38	55	80	76	27	7	2	318
%	<i>1,6</i>	<i>0,9</i>	<i>7,9</i>	<i>12,0</i>	<i>17,3</i>	<i>25,2</i>	<i>23,9</i>	<i>8,5</i>	<i>2,2</i>	<i>0,6</i>	
2012	7	4	26	35	61	103	88	35	7	0	366
%	<i>1,9</i>	<i>1,1</i>	<i>7,1</i>	<i>9,6</i>	<i>16,7</i>	<i>28,1</i>	<i>24,0</i>	<i>9,6</i>	<i>1,9</i>	<i>0,0</i>	

We further explored whether there were differences in final ranking attributable to height. Table 3 presents the data according to final ranking in the competition.

Table 3. Average height (mean±SD) according to ranking in the competition

Ranking	Group 1	Group 2	Group 3	Group 4
Height (cm)	183.9±7.4	182.7±8.0	181.4±7.4	180.7±7.1

The differences between the groups were significant ($F_{3,15.125}$, $p \leq 0.001$, $\eta^2_p = 0.021$). Post-hoc tests revealed the existence of significant differences between Group 1 and Groups 2 ($p = 0.040$), 3 ($p \leq 0.001$), and 4 ($p \leq 0.001$). Group 2 also presented significant differences with respect to Groups 3 ($p = 0.029$) and 4 ($p = 0.029$). Differences between groups 3 and 4 were not significant.

4. Discussion and conclusions

The purpose of this paper was to analyze the role of height in women's elite-level volleyball, providing data relevant both for characterization of this population and for talent promotion programs.

The players' average height was 182.5 ± 7.6 cm, above the value shown for Cuban teams⁷ and clearly superior to the values found for players of the Greek A1 division⁸ by a margin of 3 cm. This reveals that height is an important factor for playing in elite-level women's volleyball. However, this also means that players with heights ranging from 175.0 cm to 190.1 cm fall within the scope of one standard deviation. The teams' average height has been kept relatively constant over the years, ranging from 181.9 cm in 2011 to 183.5 cm in 2007. This difference of only 1.6 cm between these two extreme values implies that there is a strong stability with respect to the teams' average height. Therefore, it seems that in women the game of volleyball promotes an ideal average height that hasn't been increasing in the last eight years. This strongly suggests that other factors are more relevant for achieving elite-level performances than height alone, corroborating the position of Lidor and Ziv¹⁴.

Analysis of the distribution of height across the years provides further relevant data. Namely, from 2008 to 2012, between 1 and 2% of the participants were fewer than 160 cm. On the other end of the spectrum, there are usually less than 1% of participants over 201 cm. The bulk of the participants present heights between 176-190 cm (68.9%), but this leaves more than 30% of vacancies for shorter or taller players. Effectively, in average 7.9% of the players in this competition is under 170 cm, while this value rises up to 17.1% if we consider the players until 175 cm tall. Therefore, 2 out of 12 players participating in the WGP fall short of 175 cm. Conversely, only an average of 13.3% players each year surpasses 190 cm. As a consequence, one must understand that volleyball requires heterogeneity of player profiles to face the demands of women's elite-level competition⁸. Thus, height is but one factor that contributes to achieving such levels of performance, but it is neither sufficient nor strictly necessary in an individual basis, in line with the proposed multidimensional nature of talent^{13,15}.

Height was, however, a differentiating factor of the teams' final ranking in the competition. One-way ANOVA revealed the existence of differences between the rankings with respect to average height. Namely, teams classified in the first four spots of the competition presented an average height that was significantly superior to that found for the remaining teams. Furthermore, teams classified in the 5th to 8th spots were also significantly taller than teams positioned in the lower ends of the competition. There were no significant differences in average height between teams positioned 9th to 12th and 13th to 16th. It is possible to

conclude that height becomes more relevant if a national team aims for classifying amongst the eight best ranked in the world, and even more so if the goal is to be ranked 1st to 4th. The same effect was verified in the Greek National Leagues, where the players acting in the A1 division were circa 5 cm taller than players of the A2 division⁸, and in Brazilian under-17 players, where national team players were taller than state team players¹. Nonetheless, the difference in average height between the first four ranked teams and the last four ranked teams represents just 3.2 cm, and many factors besides height might contribute to explain such differences in performance. In their study with handball players, Lidor et al.¹² even found that height did not allow distinguishing selected and non-selected players.

In sum, our study has shown that height is a relevant factor for achieving elite-level women's volleyball, and should therefore be weighted in any talent promotion program, as had been previously shown for youth girls' volleyball¹ and also for youth boys' competitions⁵. Indeed, volleyball players that stand out with respect to their peers are already taller during adolescence¹⁴. Nonetheless, our data also provide clear evidence that height is but one factor needed to play at the highest level, and teams actually prefer to have a balance of taller and shorter players. It strongly emerges that height cannot be an elimination factor in any talent promotion programs, since nearly 20% of the players acting at elite-level competitions fall short of 176 cm. Indeed, Abbott and Collins¹⁵ specifically referred to height when stating that individuals should not be identified as talented or excluded from a talent development program based on any single component. Coaches should be cautious when attempting to predict the success of the players based on a few, simplistic data respecting their physical characteristics, due to the complex nature of talent and talent development^{2,12,13,14}. Abbott and Collins⁶ further state that any uni-dimensional models for talent promotion are likely to result in premature de-selection of talented children. Inclusively, in male junior volleyball players' technical ability has been shown to be more relevant than anthropometric features¹⁶, although this study concerns a very specific sample, perhaps not representative of the elite-level.

There are some recognized limitations to our study. Firstly, due to the nature of the data presented in the FIVB's website, it was not possible to determine the exact function of each player on the court. Since distinct playing roles pose different sets of constraints, it is possible that height is more relevant for operating at an elite-level in some game functions than in others⁴. In their study with Cuban women players, Carvajal et al.⁷ found that there were considerable differences in height depending on playing position. Specifically, the setters were shorter (178.5 ± 3.5 cm) while the middle attackers were taller (187.1 ± 2.5 cm) than average. A similar effect has been verified in high-level male volleyball⁹. As a further example, the libero player need not be so tall as an attacker, as was evidenced in the study of Malousaris et al.⁸. According to the authors, in each sport the different playing positions

may require specific physical attributes and, therefore, warrant diverse factors contributing to talent. A more thorough study of the height characteristics by playing function would warrant relevant data for talent promotion.

Furthermore, the participants registered in the site did not receive equal playing time. Some teams have registered more than twenty players each year, but only twelve can participate in each match (recently, this was extended to fourteen players). Therefore, our data are relevant for the composition of national teams as a whole, but may not extend to the players that actually participate in the matches, and does not reveal if there are significant differences between starting players and bench players. However, it does provide clear evidence that many shorter players have an important role to play in elite-level women's volleyball. Even if a shorter player is merely on the national teams' roster and does not make it to the court, data reveal they are somehow important for the preparation of the team; otherwise they would not have been selected. Some shorter players may be relevant in enhancing the quality of training sessions and on performing specific tasks during preparation; hence, they might be decisive in potentiating the quality of the players that actually get to enter the court. Moreover, recent rules changes now allow each team to use two liberos during a match. As these players are specialized in defensive actions, height is not determinant for their performance.

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