

119 - COMPARATIVE ANALYSIS OF SOMATOTYPE AND VERTICAL IMPULSE LEVELS BETWEEN SAND AND INDOOR VOLLEYBALL ATHLETES

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Introduction

Volleyball is a sport with many fans in the world, such sport is part of the Brazilian sports culture (MATIAS; GRECO, 2011).

According to Vieira and Freitas (2007, p.11) "Volleyball emerged in the late nineteenth century in Massachusetts, United States. It was created in 1895 by Willian Morgan [...]". At the time the most practiced sport was basketball and the same authors explain that due to the constant physical contact required for basketball, this would be a very violent sport for older practitioners.

So, Morgan went looking for a game appropriate for this audience. He thought of tennis, but it would be unfeasible because he needed rackets and then decided to keep only the net, which would be raised to a height of 1.98m and use a ball, made to lighter than the one used for basketball.

Thus, is the origin of the volleyball game, according to Matias and Greco (2011) in 1919, volleyball was practiced by one million people, but its expansion, beyond the borders of the United States, was due to the practice of this sport. by American soldiers during World War Ist.

After the war, many countries [...] adopted volleyball in their clubs and schools. Thus, arose the beginnings of volleyball practiced today.

From the volleyball court is the volleyball of sand. The history of this new modality begins in the nineteenth century with the new way to contemplate the beaches. Afonso (2004) explains that the beach was not always seen as a place of leisure as it is today, on the contrary, it was a dangerous place, and the immensity of the sea as scary. It is in the late nineteenth century that the beach becomes a place of walking and attracts many tourists. Thus, in the USA clubs that offer various types of activities are created and volleyball is one of them, the sport began to be practiced on the sands of beaches, being played the same way as indoor volleyball, but practiced outdoors.

They played for fun, without many rules, when they did not have enough participants for a traditional game, 6 against 6, played 4 against 4, or even 2 against 2, but did not use the full court. Smith and Feineman (1988, apud AFONSO, 2004) explain the emergence of doubles volleyball: Between 1930 or 1931. Johnson and three other men, Charley Kahn, Bill Brothers, and Johnny Allen came up with the idea of playing on a larger court and using the half court. There was synchronization and increased intensity in the game and soon the signals appeared as in the indoor inner.

From this the modality was becoming increasingly known. Afonso (2004, p. 62) explains that "With the entry of the United States into World War II (1939-45) Beach Volleyball experienced [...] an incredible spread by American troops practically all over the world".

To achieve the goal of the game, athletes of both modalities must make the ball exceed the height of the net to reach the ground of the opponent's court. This net divides the courts in equal parts, according to Rules (2015, web) is placed vertically over the center line, in the case of the volleyball court, its upper part is adjusted to 2.43 meters from the ground for men and 2, 24 meters for women. Each team, or pair, can touch the ball up to three times before passing it to the other side.

As for the number of players that make up the team Numasawa (2010, p.20) explains that there are differences in number and size of the court as well as the type of floor where the games take place, it is also possible to see differences in touches and attacks of the players.

Even though they have different rules, both sports have the same fundamentals, the same game purpose, and both indoor and sand volleyball require athletes to be tall for greater efficiency in the fundamentals of play. Due to the "natural selection" of the sport, those who meet this requirement will remain at the highest level of sport. But once the height is matched the athlete's differential will be from the height of his jump. Jumping higher than the opponent will make more efficient moves.

Junior (2012, p.1) comments that: High stature is an indispensable anthropometric component for high-level volleyball performance because it allows for greater hand range in attack and block. However, for this reach of the ball to be effective, a good volleyball kick is required.

About the vertical impulse Silva and Oliveira (2003, p.1) add that "The vertical impulse jump is also a very important base movement for certain technical gestures, and even decisive in the success of various modalities".

According to Silva (2005 apud GOMES et al, 2014, p. 153) "about 50 to 60% of motor actions in volleyball are made up of jumps and these [...] make up the greatest effort in volleyball". Needing lower limb strength to perform the movement.

Barbanti (1989, apud CRUZ, 2003, p. 52) mentions that "jumping capacity depends on the development of muscle mass and the speed of muscle contraction. Explosive force is required here, the ability to perform force in the shortest period. Thus, it is understood that to perform the vertical jump, it is necessary to apply force of the lower limbs, especially explosive force, in order to overcome the force of gravity and suspend the body mass faster and reaching the highest possible height.

Thus, having a good thrust plus a good stature, the attackers will reach the ball after the lift at its highest point (preferably above the height of the blocker's hands) so that the cut is from top to bottom towards the opponent's court floor. In the case of blockers, they shall prevent the ball from reaching its field. For this, besides having a keen technique, reading the game and knowing the exact moment to make the jump, they must [...] jump to occupy the largest air space possible, besides being high enough so that the ball does not pass over your body" (MICHA; FERREIRA, 2004, p. 07).

Authors such as Micha and Ferreira (2004), Grgantov, Katic and Marelic (2005 apud JUNIOR, 2012) and Arruda and Hespanhol (2008 apud NUMASAWA, 2010) present the jumps as an important element in the game. Attacks and blockages are

much explored fundamentals.

Knowing the importance of the jump, and consequently the strength of the lower limbs, for volleyball and beach volleyball practice, this research aims to verify if there is influence of the ground (court or sand) on the athletes' vertical impulsion, using the Jump test. vertical.

Still to achieve the research objective it is important to draw a somatotypal profile of the group. The somatotype refers to a technique of classification of the human body as its physical part and can be applied to both men and women.

Delgado (2015, web) explains that "[...] the study of somatotype is based on the principle that no two individuals are exactly alike.". But even with the differences between individuals, there are similarities that make it possible to group them into types.

As noted in 1940 by Sheldon and Stevens, as Delgado (2015, web) explains: Sheldon and Stevens realized a new way of interpreting the biotype, based on the embryonic origin of tissues (endoderm, mesoderm and ectoderm) thus classifying individuals as Endomorph, Mesomorph and Ectomorph. Sheldon later changes the name from biotype to somatotype, defining somatotype as the characteristic of the individual, considering its constitutional aspect of endomorph, mesomorph and ectomorph.

Marins and Giannichi (2003, p. 74) explain that endomorph is related to body rounding, that mesomorph to the muscle and bone component and ectomorph to body linearity. However, there is no individual who has only one component of the somatotype. Delgado (2015, web) shows that Sheldon concluded that an individual has a greater or lesser tendency for each of the components of his division.

The classification of individuals by somatotype is a widely used method. Mainly because it is a noninvasive method, which brings relevant results and has low cost. According to Monteiro, Filho and Junior (2004) the somatotype is performed by anthropometric measurements, such as measures of height, body weight, thickness of the skinfolds (tricipital, subscapular, supraspinatus and medial calf), epicondylar diameters of the femur and humerus. , and corrected arm and leg circumferences.

Thus, the use of the somatotype method is a safe way to classify the physical type of individuals, and allows selecting individuals for certain sports, since there is a specific somatotype profile for each sport.

Brazilian volleyball, both indoor and beach, is part of the world's elite sport, often winning major titles. For Cabral et al (2011) this is partly due to the constant research conducted around volleyball. The analysis proposed here is justified precisely by the importance of the research for the continuous evolution of the modalities, as well as the lack of comparative researches between court and beach volleyball.

Such analysis can provide important information about the most conducive environment for training to improve volleyball athletes' impulsion. Once understanding the influence of the soil on the athlete's vertical thrust, it is possible to use the physical preparation and training environment of one modality to improve the vertical thrust of the athletes of the other modality, thus enabling the development of both modalities.

Studies like this are important for the advancement of sport, helping in the physical and technical preparation of sports that have fundamentals, or movements in common. In order to facilitate and provide scientific support for physical education professionals working in the field of high-performance sports. Therefore, this paper aims to analyze the influence of somatotype and soil on the development of vertical impulsion of sand volleyball and court athletes.

Materials and Methods

The methodological procedures of the research are theoretical-bibliographic, field, cross-sectional and descriptive study. The research instrument used was the protocol of the Johnson and Nelson Vertical Leap (1979 apud MARINS and GIANNICHI, 2003, p. 118-119) and the somatotype of Heath and Carter (1967 apud MARINS and GIANNICHI, 2003, p. 74- 89).

The subjects involved are linked to the Santa Catarina Sports Foundation located in the city of Florianópolis-SC, totaling 20 male individuals, 10 sand volleyball athletes and 10 female athletes. indoor volleyball, under the age of 19.

Before starting the work, a contact was made with the Santa Catarina volleyball foundation, requesting authorization for research, and the ICF was given to the participants. It was applied, with all athletes who brought the signed informed consent form, the Vertical Jump test and collected Somatotype data according to their respective protocols. This work was approved by the Ethics Committee on Opinion No. 1,286,399.

Descriptive statistics with measures of central tendency (mean) and dispersion (standard deviation) were used. The Shapiro Wilk test showed normality between the investigated variables, thus opting for the parametric tests. The samples were compared by the Student's t-test for independent samples, adopting a significance level of p<0.05. Pearson's coefficient matrix was used to correlate the investigated variables and the determination coefficient, adopting Anova One Way significance level p<0.05.

The vertical jump test was performed using the Johnson and Nelson protocol (1979 apud MARINS and GIANNICHI, 2003, p. 118-119). To determine lower limb power, the Nieman Power Equation (2011, p.187) was used. The somatotype was performed using the protocol of Heath and Carter (1967 apud MARINS and GIANNICHI, 2003, p. 74-89).

The materials used were skinfold caliper Cescorf Mitutoyo model D66260; digital scale brand plenna Sport model MEA 07410; CARDIOMED stadiometer model PS - 99 / TON; Cescorf tape measure 2m vonder model; caliper model QUINELATO STAINLESS.

Interpretation Analysis and Discussion of Results

Table 1- Somatotypic frequency analysis of Joinville-SC indoor volleyball athletes and sand volleyball athletes participating in the state stage of the Santa Catarina championship.

| | Total (n=21) | | Indoor (n=11) | | Sand (n=10) | |
|-----------------------|--------------|--------|---------------|--------|-------------|--------|
| | Fx | fx (%) | fx | fx (%) | fx | fx (%) |
| Central | 1 | 5% | 1 | 9% | 0 | 0% |
| Endo-ectomorphic | 0 | 0% | 0 | 0% | 0 | 0% |
| Balanced Endomorphism | 2 | 10% | 2 | 18% | 0 | 0% |
| Endo-mesomorphic | 0 | 0% | 0 | 0% | 0 | 0% |
| Endomorph-mesomorph | 0 | 0% | 0 | 0% | 0 | 0% |
| Mesoendomorphic | 1 | 5% | 0 | 0% | 1 | 10% |
| Balanced Mesomorphism | 2 | 10% | 0 | 0% | 2 | 20% |
| Meso ectomorphic | 1 | 5% | 0 | 0% | 1 | 10% |
| Ectomorph-mesomorph | 1 | 5% | 0 | 0% | 1 | 10% |
| Ecto-mesomorphic | 2 | 10% | 0 | 0% | 2 | 20% |
| Balanced Ectomorphism | 3 | 14% | 0 | 0% | 3 | 30% |
| Ectoendomorphic | 5 | 24% | 5 | 45% | 0 | 0% |
| Ectomorph-endomorph | 3 | 14% | 3 | 27% | 0 | 0% |

fx = absolute frequency, fx (%) = relative frequency.

The highest classification frequency observed was ecto-endomorphic, 5 individuals (24%). When observed by sport, indoor volleyball is more frequent in 5 individuals (45%), classified as ecto-endomorphic. Cabral et al (2008), in their study with 14 athletes called for Brazilian male and juvenile selection, presented as results the characterization of the sample as ecto-mesomorphic. No court athlete with this classification was observed, only 2 sand volleyball athletes (20%) are classified as ecto-mesomorphic.

Beach volleyball obtained the highest frequency in 3 individuals (30%) for the balanced Ectomorphism classification. Batista et al. (2010) conducted their research with 32 male beach volleyball athletes from 16 countries participating in the 15th Pan American Games, in the somatotype it was observed that the blocking athletes were classified as endomorph-mesomorph (3,6 - 4,1 - 2.7) and defense, such as mesoendomorphic (3.2 - 5.0 - 2.2). Comparing these somatotypes, the present study found 1 (10%) individual, sand volleyball athlete, meso-endomorphic and no individual classified as endomorph-mesomorph.

In both groups studied the dominant component was ectomorphism, being the body linearity component. Cabral et al (2008, p. 72) reported that:

Volleyball athletes in general are characterized by having linearity forms with elongated proportions between the limbs. [...] the ectomorphic component is important [...] for the volleyball modality, since it concerns the relation of body mass with the individual's height, and the variable height is very important in this modality when combined with to other factors to achieve a higher level in higher volleyball categories.

Table 2 provides a comparison of vertical thrust and lower limb power among the indoor and outdoor volleyball athletes participating in this research.

Table 2- Comparison of vertical impulsion and power among under-19 volleyball and sand volleyball athletes.

| Variables/modality | Indoor X ± SD | Sand X ± SD | Δ | Δ% | p |
|--------------------|------------------|----------------|--------|-------|------|
| Vertical Jump (m) | 0,54 ± 0,08 | 0,58 ± 0,09 | 0,04 | 6,4% | 0,34 |
| Power (Watts) | 3555,8 ± 427,8 | 3249,1 ± 484,9 | -306,6 | -9,4% | 0,14 |

p= Test-t de Student (α < 0,05)

As a result, indoor volleyball averaged 0.54 ± 0.08 meters of vertical thrust and a power average of 3555.8 ± 427.8 Watts. Sand volleyball averaged 0.58 ± 0.09 meters of vertical thrust and a power average of 3249.1 ± 484.9 Watts. Comparing both modalities, sand volleyball obtained an average vertical impulse of 0.04 meters (6.4%) higher than the average of volleyball court; On the other hand, indoor volleyball had a power average of 306.6 Watts (9.4%) higher than the average power of sand volleyball. However, the differences found are not statistically significant according to Student's t-test.

Comparing the results obtained here with other similar studies, the athletes studied in this research obtained an average of vertical impulse like the data found in the literature. Medeiros et al. (2008) in their study with 5 male athletes participating in the Brazilian beach volleyball championship obtained an average vertical thrust of 58.2 ± 4.7 cm. Gheller et al (2010) in their study of 11 volleyball players from an adult team from Rio Grande do Sul, obtained an average vertical thrust of 56.6 ± 7.4 cm.

Table 3- Correlation between the somatotype, vertical impulsion and lower limb power of under-19 volleyball and sand volleyball athletes.

| Modality | | Vertical Jump | | Power | |
|---------------|-----------|---------------|----------------|--------------|----------------|
| | | r | r ² | r | r ² |
| Total (n=21) | Endomorph | -0,29 | 8% | 0,61 | 37% |
| | Mesomorph | 0,17 | 3% | 0,24 | 6% |
| | Ectomorph | 0,08 | 1% | -0,58 | 34% |
| Indoor (n=11) | Endomorph | -0,39 | 16% | 0,42 | 18% |
| | Mesomorph | 0,11 | 1% | 0,51 | 26% |
| | Ectomorph | 0,37 | 14% | -0,47 | 22% |
| Sand (n=10) | Endomorph | 0,02 | 0% | 0,91 | 83% |
| | Mesomorph | 0,01 | 0% | 0,62 | 38% |
| | Ectomorph | -0,13 | 2% | -0,73 | 53% |

Salto vertical (m), potência anaeróbica (watts), r = correlação de Pearson, r²= coeficiente de determinação.

Table 3 shows a correlation between the somatotype, vertical thrust and lower limb power of the indoor and outdoor volleyball athletes.

As a result, in indoor volleyball there was a correlation between the mesomorph component and power; in sand volleyball there was correlation between endomorph component and power; In both groups there was a negative correlation between the ectomorph component and power. The other data showed no correlation.

Thus, the data reveal that, for the subjects of this research, the greater the component of ectomorph (thinness characteristic) the lower the power, in the same way, the larger the components of mesomorph (muscularity characteristic) and endomorph (characteristic of adiposity) the greater the power.

Corroborating this statement Bacheladenski; Cassian; Queiroga (2009) state that there is importance of body weight for a better power of the individual. In the same vein, Tricoli, Barbanti and Shinzato (1994), when analyzing the muscle power of basketball and volleyball players, in absolute terms, observed superiority of basketball players compared to volleyball players, due to their higher body weight.

Conclusion

It was concluded that there was no statistically significant difference between the sand volleyball and court volleyball athletes investigated in this study in relation to vertical thrust and lower limb power. It is important to emphasize that both groups studied have the vertical impulse within what the literature suggests for their respective modalities.

There was no correlation between somatotype and vertical impulsion.

Correlation between the components of the somatotype and power was verified: in court volleyball there was a correlation between the mesomorph component and power; in sand volleyball there was correlation between endomorph component and power; In both groups there was a negative correlation between the ectomorph component and power.

Thus, this study suggests that training on different soils (court or sand) does not interfere with vertical impulsion, and emphasizes the importance of assessing athletes' biotype, which is an excellent tool for discovering talent and verifying that athletes are within the ideal biotype for athletes. the modality in which they participate. Further studies with larger samples at professional levels are recommended so that the results are more reliable with reality.

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COMPARATIVE ANALYSIS OF SOMATOTYPE AND VERTICAL IMPULSE LEVELS JUMP BETWEEN SAND AND INDOOR VOLLEYBALL ATHLETES

Abstract: Indoor and sand volleyball have similar rules and movements. The jump is one of them, being present in the execution of the main foundations of both modalities. This study aimed to analyze the influence of somatotype and soil on the development of vertical thrust of sand volleyball and indoor athletes. The Johnson and Nelson Vertical Jump test (1979 apud MARINS; GIANNICHI, 2003) was used on 11 indoor and 10 male volleyball athletes, linked to the Foundation. Santa Catarina of Sport. To better characterize the sample, to compare the somatotypic profile of the sand volleyball and court athletes and to verify if there is a correlation between the somatotype and vertical thrust, the Heath and Carter somatotype test was performed

(1967 apud MARINS; GIANNICHI, 2003, pp. 74-89). No significant differences were observed regarding the vertical impulsion and lower limb power between the sand volleyball and court athletes. Correlation between the components of the somatotype and power was verified: in the block correlation between mesomorph and power; in sand correlation between endomorph and power; In both groups there was a negative correlation between the ectomorph component and power. Thus, this study suggests that training on different soils (court or sand) does not interfere with vertical impulsion, and emphasizes the importance of assessing athletes' biotype, which is an excellent tool for discovering talent and verifying that athletes are within the ideal biotype for athletes. the modality in which they participate.

Key words: Vertical jump, Power, Somatotype, Sand volleyball, Indoor volleyball.

ANALYSE COMPARATIVE DES NIVEAUX DE SOMATOTYPE ET D'IMPULSION VERTICALE ENTRE LES ATHLÈTES DE VOLLEY-BALL SUR SABLE ET DE QUAD

Résumé: Le volleyball en salle et en sable ont des règles et des mouvements similaires. Le saut est l'un d'entre eux, étant présent dans l'exécution des fondements principaux des deux modalités. Cette étude visait à analyser l'influence du somatotype et du sol sur le développement de la poussée verticale des athlètes de volley-ball sur sable et de terrain. Le test de saut vertical de Johnson et Nelson (1979 apud MARINS; GIANNICHI, 2003) a été utilisé sur 11 athlètes de volley-ball en salle et 10 hommes, liés à la Fondation. Santa Catarina du sport. Afin de mieux caractériser l'échantillon, de comparer le profil somatotypique des athlètes de volley-ball sur sable et de terrain et de vérifier s'il existe une corrélation entre le somatotype et la poussée verticale, le test de somatotype de Heath et Carter a été réalisé (1967 apud MARINS; GIANNICHI, 2003, pp. 74-89). Aucune différence significative n'a été observée en ce qui concerne l'impulsion verticale et la puissance des membres inférieurs entre le volleyball sur sable et les athlètes sur le court. La corrélation entre les composants du somatotype et de la puissance a été vérifiée: dans le bloc, corrélation entre mésomorphie et puissance; en corrélation de sable entre endomorphie et puissance; Dans les deux groupes, il existait une corrélation négative entre la composante ectomorphie et le pouvoir. Ainsi, cette étude suggère que l'entraînement sur différents sols (court ou sable) n'interfère pas avec l'impulsion verticale et souligne l'importance d'évaluer le biotype de l'athlète, ce qui est un excellent outil pour découvrir le talent et vérifier si les athlètes sont dans le biotype idéal pour les athlètes. la modalité à laquelle ils participent.

Mots clés: Poussée verticale, Puissance, Somatotype, Volleyball sur sable, Volleyball intérieur.

ANÁLISIS COMPARATIVO DEL SOMATOTIPO Y LOS NIVELES DE IMPULSO VERTICAL ENTRE LOS ATLETAS DE VOLEIBOL DE ARENA Y CANCHA

Resumen: El voleibol de interior y de arena tiene reglas y movimientos similares. El salto es uno de ellos, estando presente en la ejecución de los fundamentos principales de ambas modalidades. Este estudio tuvo como objetivo analizar la influencia del somatotipo y el suelo en el desarrollo del empuje vertical del voleibol de arena y los atletas de la cancha. La prueba de salto vertical de Johnson y Nelson (1979 apud MARINS; GIANNICHI, 2003) se utilizó en 11 atletas de voleibol de interior y 10 atletas de arena, varones, vinculados a la Fundación Santa Catarina del Deporte. Para caracterizar mejor la muestra, para comparar el perfil somatotípico de los atletas de voleibol de arena y de interior y también para verificar si existe una correlación entre el somatotipo y el empuje vertical, se realizó la prueba de somatotipo de Heath y Carter (1967, apud MARINS; GIANNICHI, 2003, pp. 74-89). No se observaron diferencias significativas con respecto al impulso vertical y la potencia de las extremidades inferiores entre el voleibol de arena y los atletas de la cancha. Se verificó la correlación entre los componentes del somatotipo y la potencia: en el bloque correlación entre mesomorfía y potencia; en arena correlación entre endomorfía y potencia; En ambos grupos hubo una correlación negativa entre el componente ectomorfía y la potencia. Por lo tanto, este estudio sugiere que el entrenamiento en diferentes suelos (cancha o arena) no interfiere con el impulso vertical, y enfatiza la importancia de evaluar el biotipo del atleta, que es una excelente herramienta para descubrir el talento y verificar si los atletas están dentro del biotipo ideal para los atletas en la que participan.

Análise Comparativa do Somatotipo e dos níveis de Impulsão Vertical entre Atletas do Voleibol de Areia e Quadra

Resumo: O vôlei de quadra e de areia tem regras e movimentos semelhantes. O salto é um deles, estando presente na execução dos principais fundamentos das duas modalidades. Este estudo teve como objetivo analisar a influência do somatotipo e do solo no desenvolvimento da impulsão vertical de atletas do voleibol de areia e de quadra. Foi utilizado o teste de Salto Vertical de Johnson e Nelson (1979 apud MARINS; GIANNICHI, 2003), em 11 atletas de vôlei de quadra e 10 atletas de vôlei de areia, do gênero masculino, com idades inferiores a 19 anos, vinculados a Fundação Catarinense de Esporte. Para melhor caracterizar a amostra, para comparar o perfil somatotípico dos atletas de vôlei de areia e de quadra e ainda para verificar se existe correlação entre o somatotipo e a impulsão vertical foi realizado o teste de somatotipo de Heath e Carter (1967 apud MARINS; GIANNICHI, 2003, p. 74-89). Não foi observado diferenças significativas nos quesitos impulsão vertical e potência de membros inferiores entre os atletas de voleibol de areia e de quadra. Foi verificado correlação entre os componentes do somatotipo e a potência: na quadra correlação entre mesomorfia e potência; na areia correlação entre endomorfia e potência; nos dois grupos houve correlação negativa entre o componente ectomorfia e potência. Dessa forma esse estudo sugere que treinar em solos diferentes (quadra ou areia) não interfere da impulsão vertical, e enfatiza a importância de avaliar biotipo dos atletas, sendo esse um excelente instrumento para descobrir talentos e verificar se os atletas estão dentro do biotipo ideal para a modalidade da qual participam.

Palavras-chaves: Impulsão vertical, Potência, Somatotipo, Voleibol de areia, Voleibol de quadra.