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Original Article

Positional differences in the performance of volleyball players for anthropometric and psychological readiness in a congested fixture tournament

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Abstract
In a congested volleyball fixture tournament, the demands of physical and psychological responses are heightened due to the high paced nature of the tournament. Thus, some performance factors such as anthropometric characteristics coupled with psychological readiness may differentiate players in their respective roles. This study investigates the performance differences between Spiker, Libero, and Setter based on anthropometric and psychological readiness during a congested fixture tournament. Anthropometric indexes comprising of height, weight and age were assessed while test for performance strategies instrument was used to evaluate the competitional and practice psychological readiness of the players before the tournament. The players' performances were analysed in real-time during a congested fixture volleyball tournament. A discriminant analysis model demonstrated that 70.60% of the variance within the dataset could be explained in one dimension with height, competitional readiness and skill performance as the most contributing factors in separating the players. Moreover, analysis of variance revealed that spikers are significantly taller than liberos and executed higher performance compared to setters $p < 0.05$. However, no significant differences were observed between the players in psychological strategies, age, as well as weight $p > 0.05$. Volleyball players possess unique profiles that are essential for each position to ensure success. The findings herein could assist coaches and other relevant stakeholders in making an informed decision when preparing teams for a fixture congested tournament in men indoor volleyball.
Keywords: Indoor Volleyball, Psychological components, Congested fixture tournament, Anthropometric characteristics, positional requirements, Performance Analysis

Introduction

Modern indoor Volleyball has evolved into a high-intensity strength activity and is currently one of the most popular open-skilled team sports. Volleyball is considered as a team sport that entails recurrent quick bouts of high and low power; jumping and strolling action (González-Ravé et al., 2011). The nature of the sport as an open-based talent requires players to demonstrate a high degree of both perceptual and physical capability to cope with the sport's external and internal induced paced(Rabiu Muazu Musa et al., 2021). Players are required to display rapid judgments and adapt their talents to a shifting or otherwise unpredictable competition environment. With a 900-foot playground and six net players playing at a time, the players need to prevent the opponents from punching the ball across their courts, coordinating team movements through reading the game, reacting as well as moving quickly while the ball is in play.

A round-robin tournament is considered as one of the congested fixture tournament schedules in which several teams are made to play against each other within a limited time of rest interval between matches. Typically, the tournament is completed within one to two days. It is assumed from the available literature that players cover a constant level of distance at a consistent intensity coupled with similar technical and tactical performance, irrespective of the fixtures scheduling. However, a decline in players' performances has been observed by coaches when instructed to evaluate the teams and plyers' performance under a congested fixture situation(Ekstrand et al., 2004). Several players who took part in more matches during the preparation for the tournament were rated lower in performances. However, it was reported that the decline in the performance of the players may not be associated with distance coverage, technical or the tactical performance of the players, but instead to the players' inherent qualities such as interpersonal coordination, and psychological prowess that

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underlines the tactical performance of teams during the match period (Folgado et al., 2015; Vilar et al., 2012). Therefore, players may not have control over the pace and tempo during a game. However, the possession of certain performance elements such as the physical characteristics and psyche of an individual player could foster success and enable the execution of skills effectively during the game.

In the team selection and training process, precise information on players' anthropometric parameters, notably standing height, body weight, and age, as well as technical and tactical ability, can be used as reference values(M R Abdullah et al., 2017; Maliki, Abdullah, Juahir, Muhamad, et al., 2018; Najmi et al., 2018). Likewise, when volleyball players reach their peak performance period, these variables may help coaches in managing the squad. Age also serves as a temporal benchmark for calculating how long it will take to achieve peak efficiency. However, scientific proof is required to establish the link between anthropometric factors and actual performance through a randomised study design. In this regard, psychological strategies have been recorded to handle a wide range of challenges in the sports domain. For instance, some are meant to assist in igniting, controlling and sustaining motivation (Reiss et al., 2001), while others are devised to foster focus, self-determination, and emotional management (Bois et al., 2009). Thus, Volleyball, like many other non-inversion sports, is embodied by a high level of psychological demands because of the sport's fast-paced nature, particularly in a crowded fixture event where a single point can help a team move to the next stage.

Therefore, recognizing the necessary psychological characteristics coupled with the anthropometric features for each position is a nontrivial task as it could provide coaches and other stakeholders in this domain with relevant information to aid informed decisions that could be pivotal towards team success in the sport. Hence, the purpose of the present study is geared towards investigating the performance differences in different volleyball positions i.e., Spiker, Libero, and Setter based on the anthropometric and psychological strategies during a congested fixture-based tournament. It is hypothesized that some anthropometric parameters and psychological strategies could differentiate the players in their positional roles.

Material and methods

Participants

The participants in this study comprised a total of 24 teams that competed in an open volleyball competition held in Malaysia in 2020. In a typical crowded fixture tournament schedule, the teams that consisted of male players were divided into four groups (Group A-F). It is vital to note that each team is regarded as an elite squad, with players averaging at least 6 years of volleyball experience. Furthermore, several players within the squads of the various participating teams have previously featured for their states or countries in both national and international matches. The coaches, managers and the organising committee were informed about the study's objective prior to the start of data collection, and approval was received through the Volleyball Technical Committee.

Anthropometric Characteristics and Psychological Skill Readiness Assessments

Before the start of the event, all participants' basic information was recorded, including their standing height, age, weight, and years of playing experience. Standing height was measured in centimetres to the nearest 0.5 centimetres, and weight was measured in kilogrammes to the nearest 0.01 kilogramme in accordance with the standard protocol documented in the previous study (Zahari Taha et al., 2009). For the psychological readiness assessment, the test for performance strategies instrument (TOPS) firstly established and validated by the earlier investigators was applied to evaluate the psychological components of the players in this study (Thomas et al., 1999). The TOPS evaluated sixteen psychological coping strategies during competition and training. The coping strategies for the competition scale instituted self-talk, activation, imagery, emotion control, automaticity, relaxation, goal setting as well as negative thinking whilst the scale for training evaluate the said psychological variables during training except for negative thinking which is replaced by attentional control. The players completed the TOPS inventory and the summation of the scores for each player was used. Internal consistency reliability was carried out to ascertain the regularity of the responses on the items of the questionnaire. A Cronbach’s alpha coefficient analysis was used to assess the level of consistency among the items and to ensure that the items are assessing a specific construct (one-dimensional) and that the players’ responses are autonomous to one another(Rabiu Muazu Musa et al., 2020). An acceptable coefficient value of items was found ranging from 0.78 to 0.89 reflecting that the responses of the players on the instrument are consistent and reliable (Nunnally, 1994).

Notational Analysis for Performance Evaluation

For measuring the performance of each player on the squad, a total of eight technical and tactical performance indicators were examined. The players' performance was analysed in real-time using the performance parameters of ace, block, set, spike, fault, tap, dig, and passing. The aforementioned performance parameters were chosen based on their relevance to the game of volleyball, as evidenced by past researchers (Education, 2011; Giddens & Giddens, 2005). A StatWatch device; a notational analysis system supported by an android application was used as the tool for evaluating the performance of the players and the teams following

the procedures documented by the earlier investigators (Mohamad Razali Abdullah et al., 2016b). Twelve skilled performance analysts recorded the performance of each player, with each analyst covering a certain player at a time. It is important to note that the performance analysts were familiar with the performance indicators specified before the analysis began. A reliability study was performed using video from a different match. The performance analysts were recommended to notate the match independently to maintain accuracy and test the observational errors on the specified performance criteria, and their agreement was then compared. The analysts' agreement and consistency with respect to the performance metrics were assessed using the Cohen's Kappa statistical test and Cronbach's alpha analysis (McGuigan et al., 2018). A good agreement was obtained with a Kappa value of 0.92 and a Cronbach's alpha of 0.96, indicating a high level of agreement and accuracy in the analyts overall assessment.

Data Analysis

We applied a discriminant analysis (DA) in the current study to ascertain the differences between players' positions i.e., Spikers, Setters and Liberos with respect to the anthropometric characteristics coupled with the psychological readiness and performance delivery evaluated. The anthropometric characteristics, psychological readiness and performance delivery were considered as the independent variables whilst positions of the players were treated as the dependent variables. The DA model was developed by considering standard techniques. It is worth noting that in the standard method, the anthropometric, psychological readiness and performance delivery are differentiated evenly (simultaneously). Moreover, analysis of variance (ANOVA) was carried out separately where significant difference is observed, a pairwise comparison was conducted via Bonferroni to determine the source(s) of the differences. Players who were unable to play at least 70 per cent of the matches in the team were not considered for the final analysis in this study. The statistical analysis was implemented using the XLSTAT2014 add-in software for Windows. All the inferences were considered significant and drawn at $p \leq 0.05$.

Results

Table 1 tabulates the descriptive statistics of the performance parameters examined in the study. The mean and the standard deviation of the performance parameters with respect to the positions of the players are displayed.

Table 1: Descriptive statistics of the performance parameters investigated.

	Libero		Setter		Spiker	
Performance Parameters	Mean	std. dev.	Mean	std. dev.	Mean	std. dev.
Height (cm)	168.692	10.523	172.500	6.214	176.581	9.352
Age (years)	24.077	6.116	25.167	6.715	23.000	4.659
Weight (kg)	65.923	17.481	74.500	25.077	70.573	18.818
Competitional Readiness	29.846	2.835	27.694	4.782	29.560	4.365
Practice Readiness	30.308	2.942	27.569	4.400	29.698	4.134
Performance	9.538	12.474	9.056	8.694	17.968	16.200

Table 2 reveals the performance variables contributing towards separating the players in their respective positional roles. It could be seen from the table that factor 1 demonstrated a total of 70.60% variance within the dataset that could be explained in one dimension with height, competitional readiness as well as skill performance as the most contributing factors in separating the players.

Table 2. Performance factors discriminating the players.

Performance Parameters	F1	F2
Height (cm)	0.657	0.474
Weight (kg)	-0.173	0.250
Age (years)	-0.375	0.275
Competitional-readiness	0.364	0.869
Practice-readiness	0.050	-1.607
Performance	0.531	0.050
Cumulative Variability (%)	**70.64**	**29.36**

Figure 1 projects the ability of the discriminant model in discerning the players from their positional roles with respect to the performance factors examined. It could be observed from the figure that a clear separation of the players is provided by the model which explains that the players differed in their performance capability and their characteristics.

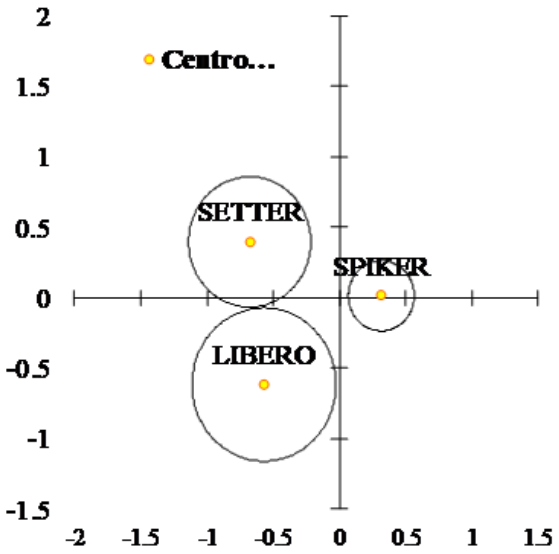

Figure 1: Separation efficacy of the discriminant model based on the variables evaluated.

Table 3 tabulates the analysis of variance coupled with the pairwise comparison carried out as follow up to determine the difference of the players with regards to the performance variables assessed. It could be seen from the table that the positions of the players, the standard error, the mean differences, and the p values are shown. It could be observed from the table that spikers are significantly taller than liberos and executed higher performance compared to setters $p < 0.05$. However, no significant differences were observed between the players in their psychological strategies i.e., competitional readiness and practice readiness, age, and weight, $p > 0.05$.

Performance Parameters	Position	Standard Error	Mean Diff	P-value
Height	SPIKER vs LIBERO	1.145	2.867	0.005*
	SPIKER vs SETTER	2.126	1.690	0.095
	SETTER vs LIBERO	2.501	1.160	0.249
Weight	SPIKER vs LIBERO	4.711	0.763	0.242
	SETTER vs SPIKER	2.539	0.734	0.465
	SETTER vs LIBERO	5.544	1.179	0.448
Age	SETTER vs SPIKER	1.252	1.523	0.131
	SETTER vs LIBERO	1.473	0.564	0.574
	LIBERO vs SPIKER	0.675	0.665	0.508
Competitional-readiness	LIBERO vs SETTER	1.187	1.382	0.171
	LIBERO vs SPIKER	0.543	0.219	0.827
	SPIKER vs SETTER	1.009	1.629	0.107
Practice-readiness	LIBERO vs SETTER	1.123	1.858	0.066
	LIBERO vs SPIKER	0.514	0.494	0.623
	SPIKER vs SETTER	0.954	1.963	0.053
Performance	SPIKER vs SETTER	1.853	2.281	0.025*
	SPIKER vs LIBERO	4.047	1.894	0.061
	LIBERO vs SETTER	3.439	0.091	0.928

*<0.05

Discussion

It is shown from the findings of the study that height, competitional readiness as well as skill performance are the most contributing factors in separating the players (table 2). Certain physical features coupled with body composition are stated to be essential in the categorization as well as separation of athletic

accomplishments (MOHAMAD RAZALI Abdullah et al., 2016; Maliki, Abdullah, Juahir, Abdullah, et al., 2018; R Muazu Musa et al., 2019; Razali et al., 2017). In men's volleyball, for example, research has shown an increasing propensity to use tall players (Reilly et al., 1990). Taller players were more likely to be used in modern indoor volleyball as previously reported in different studies. For example, the average height of elite volleyball players was 195 cm in a previous study, however, an average height of 200 cm was reported in more recent studies (Reilly et al., 1990; Stamm et al., 2017). Theoretically, the taller an individual is, the more probable that he or she will be chosen over other shorter players. On the other hand, psychological readiness and strategies particularly during competition are pivotal towards the success of a team in indoor volleyball competitions. Additionally, the nature of the game and its facilities specifically the players physical traits, the size of the net and court, and the match's schedule necessitate a high level of psychological skill (Rabiu Muazu Musa et al., 2021). During the competition, the aforementioned factors could potentially provoke minor errors that could be costly to a team and potentially change the match's outcome. (Shea & Kohl, 1991). Hence, the ability of the player(s) to maintain the tempo and composure regardless of the match status or environment, is essential for success in this sport.

The study findings further revealed that spikers are significantly taller than liberos and executed higher performance compared to setters as demonstrated in Table 3. This finding is congruent with the previous investigations in which the researchers discriminated against volleyball players with respect to the positional roles as well as their degree of proficiency (Milić et al., 2017). It was determined from the findings that the middle hitters (also known as spikers, opposite hitters, and middle blockers) were taller, more ectomorphic and endomorphic, while liberos were shorter, less ectomorphic, more mesomorphic and more endomorphic as compared with the players in the other positions. This unique characteristic of the spiker is essential since a player in such a position is required to be tall as he/she serves as the first line of defence and lead the attack in an offensive technique. The spikers are also expected to be more skilful and quicker on their feet to adapt to different situations during the game since the ball might not always be set where they prefer. Hence, the higher performance delivery demonstrated by the spikers in comparison to the other positions portrayed the importance of the position in the sport, especially in a congested fixture where every point earned is crucial in advancing the team to the next stage.

It is evident from the findings of the current investigation that the psychological strategies i.e., competitional and practice readiness coupled with age and weight are vital in each position as reflected in Table 3. The needs for different forms of sports skills and training have grown greatly, and the gap in performance among players and achievements has seamlessly narrowed, hence psychological capabilities are increasingly becoming imperative such that coaches and trainers begin emphasizing the importance of psychological skills towards the effective delivery of performance in myriad sports (Mohamad Razali Abdullah & Maliki, n.d.; Mohamad Razali Abdullah et al., 2016a; John et al., 2011; Mohammadzadeh & Sami, 2014; Shea & Kohl, 1991; Z Taha et al., 2018). The outcomes of this study are consistent with prior research, which found that successful elite volleyball players had superior mental fitness than unsuccessful ones (Mohammadzadeh & Sami, 2014). Moreover, it was acknowledged by the researchers those exceptional players have a high level of self-confidence, better attention, and mental toughness, all of which protect them from being impacted by emotions and consequently serve useful towards more successful performance delivery. On the other hand, as shown in Figure 2, thorough information about the players' anthropometric attributes, notably their body weight, age, and performance ability, might be used as reference values in the team selection and training process (M R Abdullah et al., 2017; Maliki, Abdullah, Juahir, Muhamad, et al., 2018; Najmi et al., 2018). Once volleyball players reach their peak performance, these variables may help coaches manage the squad. Moreover, age could also serve as a temporal reference point for calculating how long it will take to achieve peak performance.

Conclusion

It is demonstrated from the findings of the current investigation that successful performance in elite men's indoor volleyball tournaments could be influenced by the players' characteristics and psychological readiness during both competition and training. It is demonstrated that certain anthropometric variables could differentiate volleyball players in their respective positional roles. The spikers in this sport are importantly taller, somewhat younger, as well as slightly heavier whereas the setters are observed to be heavier and recorded comparatively lower scores in psychological readiness as well as performance skill delivery. The liberos are shown to be of comparatively moderate skill performance delivery, however, are greater in psychological skill strategies of both competition and practice readiness as well as shorter, less heavy amongst the other two positions. It is tempting therefore to postulate from the findings of the present investigation that although, all the positions have their unique profiles which reflects that those unique features are essential for each position to ensure success. Nonetheless, the spikers are observed to obtain certain essential features and contribute higher in performance delivery which portrayed that the role of spikers is non-trivial towards the team success in a congested fixture tournament. It is, however, important to stress that the collective efforts of all the positions are necessary for the attainment of a performance edge over the opposing team during the tournament. The performance factors outlined in this study could be beneficial to coaches as well as the other relevant

stakeholders in making an informed decision when preparing teams for a fixture congested tournament in this sport.

References

Abdullah, M R, Maliki, A., Musa, R. M., Kosni, N. A., Juahir, H., & Mohamed, S. B. (2017). Identification and Comparative Analysis of Essential Performance Indicators in Two Levels of Soccer Expertise. *International Journal on Advanced Science, Engineering and Information Technology*, *7*(1), 305–314.

Abdullah, Mohamad Razali, & Maliki, A. B. H. M. (n.d.). RELIABILITY OF TEST OF PERFORMANCE STRATEGIES-COMPETITION SCALE (TOPS-CS) AMONG... *Man in India*, *96*(12), 5199–5207.

Abdullah, MOHAMAD RAZALI, Musa, R. M., Kosni, N. A., Maliki, A., & Haque, M. (2016). Profiling and distinction of specific skills related performance and fitness level between senior and junior Malaysian youth soccer players. *International Journal of Pharmaceutical Research*, *8*(3), 64–71.

Abdullah, Mohamad Razali, Musa, R. M., Maliki, A. B. H. M. B., Kosni, N. A., & Suppiah, P. K. (2016a). Role of psychological factors on the performance of elite soccer players. *Journal of Physical Education and Sport*, *16*(1), 170.

Abdullah, Mohamad Razali, Musa, R. M., Maliki, A. B. H. M., Kosni, N. A., & Suppiah, P. K. (2016b). Development of tablet application based notational analysis system and the establishment of its reliability in soccer. *Journal of Physical Education and Sport*, *16*(3), 951–956. https://doi.org/10.7752/jpes.2016.03150

Bois, J. E., Sarrazin, P. G., Southon, J., & Boiché, J. C. S. (2009). Psychological characteristics and their relation to performance in professional golfers. *The Sport Psychologist*, *23*(2), 252–270.

Education, C. (2011). *Coaching volleyball technical and tactical skills*. Human Kinetics.

Ekstrand, J., Waldén, M., & Hägglund, M. (2004). A congested football calendar and the wellbeing of players: correlation between match exposure of European footballers before the World Cup 2002 and their injuries and performances during that World Cup. *British Journal of Sports Medicine*, *38*(4), 493–497.

Folgado, H., Duarte, R., Marques, P., & Sampaio, J. (2015). The effects of congested fixtures period on tactical and physical performance in elite football. *Journal of Sports Sciences*, *33*(12), 1238–1247. https://doi.org/10.1080/02640414.2015.1022576

Giddens, S., & Giddens, O. (2005). *Volleyball: Rules, Tips, Strategy, and Safety*. The Rosen Publishing Group.

González-Ravé, J. M., Arija, A., & Clemente-Suarez, V. (2011). Seasonal changes in jump performance and body composition in women volleyball players. *The Journal of Strength & Conditioning Research*, *25*(6), 1492–1501.

John, S., Verma, S. K., & Khanna, G. L. (2011). The effect of mindfulness meditation on HPA-Axis in pre-competition stress in sports performance of elite shooters. *National Journal of Integrated Research in Medicine*, *2*(3), 15–21.

Maliki, A. B. H. M., Abdullah, M. R., Juahir, H., Abdullah, F., Abdullah, N. A. S., Musa, R. M., Mat-Rasid, S. M., Adnan, A., Kosni, N. A., Muhamad, W. S. A. W., & Nasir, N. A. M. (2018). A multilateral modelling of Youth Soccer Performance Index (YSPI). *IOP Conference Series: Materials Science and Engineering*, *342*, 012057. https://doi.org/10.1088/1757-899X/342/1/012057

Maliki, A. B. H. M., Abdullah, M. R., Juahir, H., Muhamad, W. S. A. W., Nasir, N. A. M., Musa, R. M., Mat-Rasid, S. M., Adnan, A., Kosni, N. A., Abdullah, F., & Abdullah, N. A. S. (2018). The role of anthropometric, growth and maturity index (AGaMI) influencing youth soccer relative performance. *IOP Conference Series: Materials Science and Engineering*, *342*(1). https://doi.org/10.1088/1757-899X/342/1/012056

McGuigan, K., Hughes, M., & Martin, D. (2018). Performance indicators in club level Gaelic football. *International Journal of Performance Analysis in Sport*, *18*(5), 780–795. https://doi.org/10.1080/24748668.2018.1517291

Milić, M., Grgantov, Z., Chamari, K., Ardigò, L. P., Bianco, A., & Padulo, J. (2017). Anthropometric and physical characteristics allow differentiation of young female volleyball players according to playing position and level of expertise. *Biology of Sport*, *34*(1), 19.

Mohammadzadeh, H., & Sami, S. (2014). Psychological skills of elite and non-elite volleyball players. *Annals of Applied Sport Science*, *2*(1), 31–36.

Musa, R Muazu, Majeed, A. P. P. A., Taha, Z., Abdullah, M. R., Maliki, A. B. H. M., & Kosni, N. A. (2019). The application of Artificial Neural Network and k-Nearest Neighbour classification models in the scouting of high-performance archers from a selected fitness and motor skill performance parameters. *Science & Sports*, *34*(4), e241–e249.

Musa, Rabiu Muazu, Abdul Majeed, A. P. P., Suhaimi, M. Z., Abdullah, M. R., Mohd Razman, M. A., Abdelhakim, D., & Abu Osman, N. A. (2021). Identification of high-performance volleyball players from anthropometric variables and psychological readiness: A machine-learning approach. *Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology*. https://doi.org/10.1177/17543371211045451

Musa, Rabiu Muazu, Kannan, J. A. P., Nek, U. K. W., Rashid, N. W. F. M., Ali, A. M., & Rashid, N. A. S. A. (2020). Appraisal of wellness-lifestyle status among Malaysian undergraduate students: A cross-sectional and gender-based wellness survey. *Journal of Applied Pharmaceutical Science*, *10*(09), 82–87.

Najmi, N., Abdullah, M. R., Juahir, H., Maliki, A., Musa, R. M., Mat-Rasid, S. M., Adnan, A., Kosni, N. A., Eswaramoorthi, V., & Alias, N. (2018). Comparison of body fat percentage and physical performance of male national senior and junior karate athletes. *Journal of Fundamental and Applied Sciences*, *10*(1S), 485–511.

Nunnally, J. C. (1994). *Psychometric theory 3E*. Tata McGraw-Hill Education.

Razali, M. R., Alias, N., Maliki, A., Musa, R. M., Kosni, L. A., & Juahir, H. (2017). Unsupervised Pattern Recognition of Physical Fitness Related Performance Parameters among Terengganu Youth Female Field Hockey Players. *International Journal on Advanced Science, Engineering and Information Technology*, *7*(1), 100–105.

Reilly, T., Secher, N., Snell, P., & Williams, C. (1990). Physiology of sports: An overview. *Physiology of Sports*, 465–485.

Reiss, S., Wiltz, J., & Sherman, M. (2001). Trait motivational correlates of athleticism. *Personality and Individual Differences*, *30*(7), 1139–1145.

Shea, C. H., & Kohl, R. M. (1991). Composition of practice: Influence on the retention of motor skills. *Research Quarterly for Exercise and Sport*, *62*(2), 187–195.

Stamm, R., Stamm, M., Jairus, A., Toop, R., Tuula, R., & João, P. V. (2017). Do height and weight play an important role in block and attack efficiency in high-level men's volleyball? *Papers on Anthropology*, *26*(1), 64–71.

Taha, Z, Musa, R. M., Abdullah, M. R., Maliki, A., Kosni, N. A., Mat-Rasid, S. M., Adnan, A., & Juahir, H. (2018). Supervised pattern recognition of archers' relative psychological coping skills as a component for a better archery performance. *Journal of Fundamental and Applied Sciences*, *10*(1S), 467–484.

Taha, Zahari, Haque, M., Musa, R. M., Abdullah, M. R., Maliki, A., Alias, N., & Kosni, N. A. (2009). Intelligent prediction of suitable physical characteristics toward archery performance using multivariate techniques. *J Glob Pharma Technol*, *9*(7), 44–52.

Thomas, P. R., Murphy, S. M., & Hardy, L. E. W. (1999). Test of performance strategies: Development and preliminary validation of a comprehensive measure of athletes' psychological skills. *Journal of Sports Sciences*, *17*(9), 697–711.

Vilar, L., Araújo, D., Davids, K., & Button, C. (2012). The role of ecological dynamics in analysing performance in team sports. *Sports Medicine*, *42*(1), 1–10.