

MOTOR SKILLS IN FEMALE JUNIOR VOLLEYBALL PLAYERS FROM MACEDONIA AND PLAYERS FROM OTHER COUNTRIES: A COMPARATIVE STUDY

DOI:

(Original scientific paper)

**Fidanka Vasileva^{1,2}, Andrijana Misovski³, Josko Milenkoski³, Georgi Georgiev³,
Angjel Vasilev⁴**

¹University School of Health and Sport, University of Girona, Girona, Spain

²Biomedical Research Institute of Girona Dr. Josep Trueta, Girona, Spain

³University Ss. Cyril and Methodius, Faculty of Physical Education, Sport and Health, Skopje, Republic of Macedonia

⁴Elementary School Dimkata Angelov Gaberot - Vatasha, Kavadarci, Republic of Macedonia

Abstract

Modern volleyball game requires a high level of specific motor skills in the players. Our objectives are: 1) to evaluate specific motor skills (setting and forearm passing) in Macedonian female junior volleyball players; and 2) to compare our players with players from other countries in a qualitative manner. A sample of 399 participants, female volleyball players aged 13-18 years, that are part of Junior League (JL) in Macedonia, and JL in other countries, were included. Players from Macedonian JL (N=30) were evaluated at the Faculty of Physical Education, Sport and Health in Skopje, Republic of Macedonia. In order to extract data for players from other countries (N=369), articles published in peer-reviewed journals were used. Only players from studies applying the same motor skill tests as the ones used in our study were included. With the aim to compare the players, a single Microsoft Office Excel spreadsheet was created containing all the data from our evaluation, as well as the data that we have previously extracted from other articles. Data analysis tool in Microsoft Office Excel 2010 was used to test the normality of data distribution by applying K-S test, Skewness and Kurtosis values. Basic mathematical and appropriate statistical methods were used to calculate descriptive statistical parameters. Finally, graphs were created. Setting and Forearm Passing skills are less developed in Macedonian JL players than in players from India, UK, Italy, USA, Germany, and Norway. Thus, we would advise Macedonian coaches to work more in a direction of specific motor skills development, especially in pioneer and youth categories, instead of putting the main emphasis on player specialization at early age.

Key words: volleyball, motor skills, setting, forearm passing, comparison.

Introduction

Success in professional volleyball is determined by many factors such as: motor skills and abilities, psychological conditions, and morphological structure of the players. Modern volleyball game requires from the players a high level of specific motor skills that are defining the volleyball game and certain playing positions (Martinovic, Dopsaj, V., Kotur-Stevuljević, Dopsaj, M., Vujovic, Stefanovic, & Nestic, 2011). Motor skill is defined as the movement of body components towards programmed goals, and the basic abilities that undertake the task of generating the movements (Goodway et al 2019; Lopes et al., 2013). The level of motor skills is closely related to intelligence, age, anxiety, fatigue, general motivation, environmental factors, and the level of participation in sports (Sayin, 2011; Timmons et al., 2007). Motor skills affect the general performance of athletes. Moreover, there is a positive relation between motor skills, performance, and efficiency (Goodway et al., 2019). Also, they are important indicators that differentiate the quality of the players. In players which motor skills are not at the desired level, fatigue starts earlier, and the application of technical and tactical skills decrease (Uslu et al., 2021).

In contemporary volleyball, players must be prepared to perform technical and tactical elements perfectly, because the match outcome depends on a variety of specific elements, and the final score depends

on the quality of attacks, blocks, serves, as well as the number of the opponent's errors (Conti et al., 2011; Hughes & Daniel, 2003; Marcelino & Mesquita, 2006; Marcelino et al., 2008).

According to Miskin et al. (2010), volleyball coaches should estimate different performance skills of individual players during sets and matches, and then adjust the training cycle of the team focusing on the development of key motor skills that significantly determine players' scoring abilities. Forearm passing (FP) and Setting (SET) are considered as determinants of team's success, since they play an important role during defence, and offence organization as well, meaning they have a direct impact in scoring and final match outcome (Uslu et al., 2021). Furthermore, Marelic et al. (2004) and Mahmutovic et al. (2011), reported that there is a significant relation between the reception rate and the successful outcome of the match.

Therefore, our objectives are: 1) to evaluate specific motor skills (setting and forearm passing) in Macedonian female junior volleyball players; and 2) to compare our players with players from other countries in a qualitative manner.

Materials and methods

Participants

The comparative study is realized on a sample of 399 participants, female volleyball players aged 13-18 years, that are part of Junior League (JL) in Macedonia, and JL in other countries. Players from Macedonian JL (N=30) were evaluated at the Faculty of Physical Education, Sport and health in Skopje, Republic of Macedonia. In order to extract data for players from other countries (N=369), articles published in peer-reviewed journals were used (Baddaruddoza & Patharia, 2012; Chatterjee, S. & Chatterjee, P., 2001; Fritsch et al., 2010; Luciano et al., 2004; Rozin et al., 2000; Stefan et al., 2000; Tambs et al., 2001; Thomas & Semmler, 2012; Wells & Dillon, 2002; Williams & Gross, 2008). Only players from studies applying the same motor skill tests as the ones used in our study were included.

Instruments

In order to realise the particular aim of the study, we assessed specific motor skills such as setting and forearm passing in our players by applying:

- SET (R-L) (Collins & Hodges, 2001);
- Forearm pass (FP) (R-L) (Collins & Hodges, 2001)

The rest of the data regarding motor skills in players from other countries were extracted from peer-reviewed published articles (Baddaruddoza & Patharia, 2012; Chatterjee, S. & Chatterjee, P., 2001; Fritsch et al., 2010; Luciano et al., 2004; Rozin et al., 2000; Stefan et al., 2000; Tambs et al., 2001; Thomas & Semmler, 2012; Wells & Dillon, 2002; Williams & Gross, 2008).

Data analysis

With the aim to compare the players, a single Microsoft Office Excel spreadsheet was created containing all the data from our evaluation, as well as the data that we have previously extracted from other articles. Data analysis tool in Microsoft Office Excel 2010 was used to test the normality of data distribution by applying K-S test, Skewness and Kurtosis values. Basic mathematical and appropriate statistical methods were used to calculate descriptive statistical parameters. Finally, graphs were created.

Results and discussion

According to the data presented in Table 1, our results have a normal distribution, with a normal asymmetry, which is considered when values for Skewness are in a range between -1,00 to 1,00 (Zeqiri et al., 2020). Except the Kurtosis value for height, that is not in the ideal range of -3 to 3, but if we take in consideration the SD value in addition to the Kurtosis value, as proposed by Kallner (2013), this might be acceptable.

Based on the results presented in Table 2, Macedonian JL players have lower values for motor skills tests than players from India, UK, Italy, USA, Germany, and Norway (Baddaruddoza & Patharia, 2012; Chatterjee, S. et al., 2001; Fritsch et al., 2010; Luciano et al., 2004; Rozin et al., 2000; Stefan et al., 2000; Tambs et al., 2001; Thomas & Semmler, 2012; Wells & Dillon, 2002; Williams & Gross, 2008).

Table 1. Descriptive statistical parameters of Macedonian JL players

	N	Min	Max	X	SD	CV%	Skewness	Kurtosis	K-S
Height (cm)	30	155,00	185,00	174,70	5,94	3,40	-0,91	3,20	p > .20
Weight (kg)	30	48,00	77,00	60,53	6,28	10,37	0,39	0,42	p > .20
BMI	30	17,04	24,03	19,81	1,44	7,26	0,49	-0,17	p > .20
SET (R-L)	30	29,00	40,00	34,69	3,27	9,42	-0,57	-0,41	p > .20
FP (R-L)	30	14,00	29,00	22,69	4,12	18,16	-0,18	0,44	p > .20

Table 2. Arithmetic mean and standard deviation of specific motor skills in JL players from other countries

Country	Authors	N	X±SD	
			SET (R-L)	FP (R-L)
India	Badaruddoza&Patharia (2012)	24	41,12±3,05	30,58±4,30
UK	Chatterjee, S. &Chatterjee, P. (2001)	17	36,19±3,30	25,14±4,23
UK	Fritsch, et al. (2010)	40	38,05±3,47	30,29±3,02
Italy	Luciano, Wright, & Martin (2004)	62	36,92±3,15	31,18±3,47
USA	Rozin, Fallon, &Mandell (2000)	64	37,03±3,32	25,73±4,28
Germany	Stefan, et al. (2000)	20	38,54±4,98	26,82±4,63
Norway	Tambs, et al. (2001)	35	38,92±3,30	26,8±5,16
UK	Thomas &Semmler (2012)	35	38,06±3,67	32,49±3,58
USA	Wells &Dillon (2002)	14	38,70±3,46	/
USA	Williams &Gross (2008)	58	35,27±3,40	24,68±4,22

Macedonian JL players have performed fewer number of repetitions in SET (R-L) and FP (R-L) tests, meaning that their setting and forearm passing skills are less developed than setting and forearm passing skills in players from India, UK, Italy, USA, Germany, and Norway (Figures 1 and 2).

Motor skills differentiate the quality of the players. Uslu et al. (2021) have reported that in players whose motor skills are not at the desired level, fatigue starts earlier, and the application of technical and tactical skills decrease. Also motor skills affect the general performance of athletes. Goodway et al. (2019) found a positive relation between motor skills, performance, and efficiency.

Thus, players must have motor skills developed on a highest level in order to be prepared to perform technical and tactical elements perfectly. It is generally reported that the match outcome depends on a variety of specific elements, and the final score depends on the quality of attacks, blocks, serves, as well as the number of the opponent's errors (Conti et al., 2011; Hughes & Daniel, 2003; Marcelino&Mesquita, 2006; Marcelino et al., 2008).

Moreover, it is reported that there is a significant relation between the reception rate and the successful outcome of the match (Marelic et al., 2004; Mahmutovic et al., 2011). Since forearm passing and setting are directly related to defense reception and offence organization respectively, they are considered as determinants of team's success because they have a direct impact in scoring and final match outcome (Uslu et al., 2021).

As motor skills and motor performance are powerful indicators for success in sport (Pion et al., 2015), we advise Macedonian coaches to work more in direction of motor skills development and technique improvement, especially in pioneer and youth categories, instead of putting the main emphasis on player specialization at early age.

In addition, it is reported in literature that elite volleyball players have motor skills and abilities developed on a higher level than non-elite players (Fry et al., 1991; Sheppard et al., 2007; Smith et al., 1992; Martinovic et al., 2011). Based on what is presented in Figure 1, setting skills are most developed in Indian players, while forearm passing skills in players from United Kingdom (Figure 2). On the other hand, according to FIVB (2021) world ranking for girls under 18, India and United Kingdom share the 52nd place "at the bottom" of the world ranking table. Actually, here comes into consideration the heterogeneity of the samples in terms of competitive level. Unfortunately, we do not have information about the competitive level of the players that are included in our study. Our inclusion criteria was players to be part of Junior NL, but some of the players that are part of Junior NL, might also be part of the Junior National Team, or

even Senior NL and Senior National Team, meaning that their competitive level would be higher. The higher the competitive level of a player is – the higher the quality and efficiency of the player should be (Katic et al., 2006).

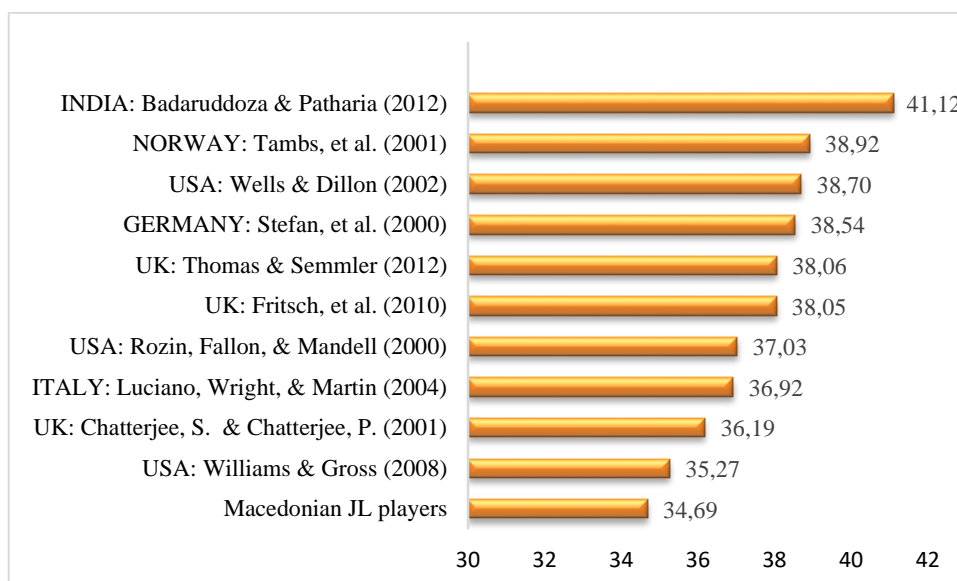


Figure 1.SET (R-L) in Macedonian JL players and players from other countries

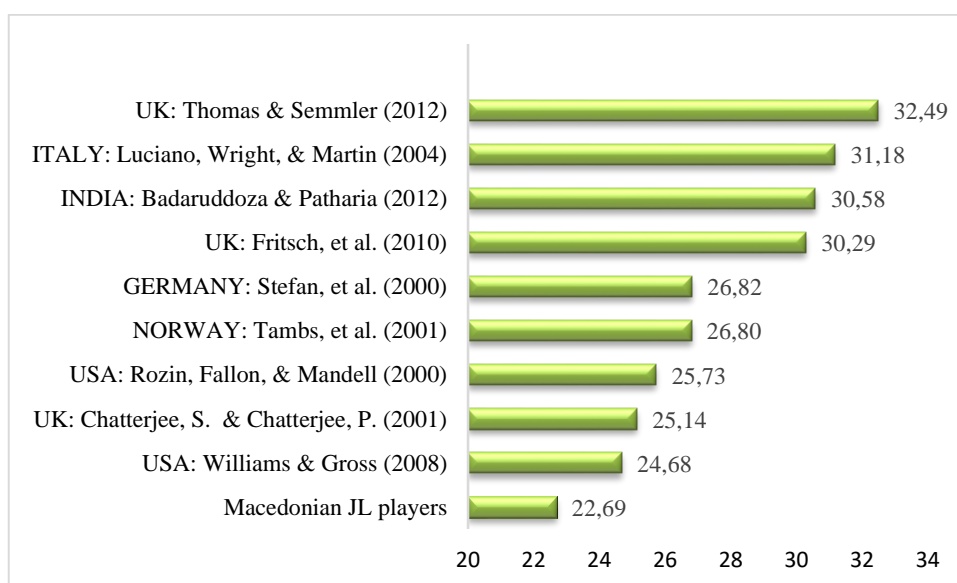


Figure 2.FP (R-L) in Macedonian JL players and players from other countries

And setting and forearm passing skills have a direct impact on player's efficiency and scoring abilities (Uslu et al., 2021). Therefore, we will not be able to do any further conclusions regarding the other countries included in the study because we assume that this methodological weakness might influenced the results. However, it is still obvious that Macedonian coaches should focus more on motor and technical skills of the players.

Conclusion

Setting and Forearm Passing skills are less developed in Macedonian JL players than in players from India, UK, Italy, USA, Germany, and Norway. Thus, we would advise Macedonian coaches to work more in a direction of specific motor skills development and technique improvement, especially in pioneer and youth categories, instead of putting the main emphasis on player specialization at early age.

Acknowledgements

FV holds a fellowship from the Agency for the Management of University and Research Grants (2021 FI_B 00293) supported by the Secretariat for Universities and Research of the Ministry of Business and Knowledge of the Government of Catalonia, and the European Social Fund.

References

- Badaruddoza, B., & Patharia, A. (2012). Motor skill and performance in volleyball. *Journal of Sport Sciences*, 12 (2), 74-82.
- Bompa, T. (1999). Periodization. *Theory and Methodology of Training (4th ed)*. Champaign, IL: Human Kinetics.
- Chatterjee, S. & Chatterjee, P. (2001). Anthropometrics, motor skills, and motor performance in volleyball. *Journal of Sport Sciences*, 4 (6), 309-314.
- Collins, D. R., & Hodges, P. B. (2001). *A Comprehensive Guide to Sports Skills Tests and Measurement*. Lanham: RowmanLittlefield.
- Dopsaj, M., Nešić, G., & Čopić, N. (2010). The multicentroid position of the anthropomorphological profile of female volleyball players at different competitive levels. *FactaUniversitatis, series: Physical Education and Sport*, 8(1), 47-57.
- Ellis, L., Gastin, P., Lawrence, S., Savage, B., Sheales, A., Stapff, A., Tumilty, D., Quinn, A., Woolford, S., Young, W. (2000). Testing protocols for team sport players. *Physiological Tests for Elite Athletes*. C.J. Gore, ed. Champaign, IL: Human Kinetics, 128-144.
- FIVB.(2021). FIVB world ranking - GIRLS' U18. [online] Available at: <https://www.fivb.com/en/volleyball/rankings/rankinggirlsunder18>.
- Fritsch, B., Reis, J., Martinowich, K., Schambra, & Cohen, L. (2010). Motor skills and performance in young female volleyball players. *Journal of Sport and Exercise*, 66 (2), 198-204.
- Fry, A. C., Kraemer, W. J., Weseman, C. A., Contory, B. P., Gordon, S. E., Hoffman, J. R. and Maresh, C. M. (1991). The Effects of an Off-season Strength and Conditioning Program on Starters and Non-Starters in Women's Intercollegiate Volleyball. *Journal of Applied Sport Science Research*, 5, 174-181.
- Fry, A.C., Kraemer, W.J., Weseman, C.A., Contory, B.P., Gordon, S.E., Hoffman, J.R.&Maresh, C.M. (1991). The Effects of an Off-season Strength and Conditioning Program on Starters and Non-Starters in Women's Intercollegiate Volleyball. *Journal of Applied Sport Science Research*, 5, 174-181.
- Goodway, J.D., Ozmun,&J.C., Gallahue, D.L. (2019). Understanding motor development: Infants, children, adolescents, adults: *Jones & Bartlett Learning*
- Hughes, M. & Daniel R. (2003). Playing patterns of elite and non-elite volleyball. *International Journal of Performance Analysis in Sport*, 3, 50-56.
- Kallner, A. (2013). *Laboratory Statistics*. Elsevier Science.
- Katić, R., Grgantov, Z. & Jurko, D. (2006). Motor structures in female volleyball players aged 14-17 according to technique quality and performance. *Collegium Antropologicum*, 103-112.
- Katić, R., Grgantov, Z., & Jurko, D. (2006). Motor structures in female volleyball players aged 14-17 according to technique quality and performance. *Collegium Antropologicum*, 1, 103-112.
- Lopes, L., Santos, R., Pereira, B., & Lopes, V.P. (2013). Associations between gross motor coordination and academic achievement in elementary school children. *Human movement science*, 32(1), 9-20.
- Luciano, M., Wright, M., & Martin, N.G. (2004). Establishment of motor skills in college volleyball players. *Journal of Sport*, 34 (1), 41-50.
- Mahmutović, I., Osmankač, N., Sattler, T., Milenkoski, J., Lakota, R. (2011). The effect of hypothetical predictors on the representation of characteristic modality serves in volleyball. *Sport Science*, 6.
- Marcelino R, Mesquita I, & Afonso J. (2008). The weight of terminal actions in volleyball. Contributions of the spike, serve and block for the teams' rankings in the World League 2005. *International Journal of Performance Analysis in sport*, 8, 1-7.
- Marcelino, R., & Mesquita, I. (2006). Characterizing the efficacy of skills in high performance competitive volleyball. *World Congress of Performance Analysis of Performance Hungary*, 7, 491-496.
- Marelić, N., Rešetar, T., Janković, V. (2004). Discriminant analysis of the sets won and the sets lost by one team in A1 Italian volleyball league-A case study. *Kinesiology*, 36(1), 75-82.
- Marques, J. N. (2017). Jump test to evaluate the volleyball player. *Revista Brasileira de Prescrição e Fisiologia do Exercício*, 11.
- Marques, M. C., Van Den Tillaar, R., Gabbett, T. J., Reis, V. M., & González-Badillo, J. J. (2009). Physical fitness qualities of professional volleyball players: Determination of positional differences. *Journal of Strength and Conditioning Research*, 23(4), 1106-1111. doi: 10.1519/JSC.0b013e31819b78c4.
- Martinović, J., Dopsaj, V., Kotur-Stevuljević, J., Dopsaj, M., Vujović, A., Stefanović, A. & Nešić, G. (2011). Oxidative stress biomarker monitoring in elite women volleyball athletes during a 6-week training period. *Journal of Strength and Conditioning Research*, 71(5), 1360-1367.
- Martinović, J., Dopsaj, V., Kotur-Stevuljević, J., Dopsaj, M., Vujović, A., Stefanović, A., & Nešić G. (2011). Oxidative stress biomarker monitoring in elite women volleyball athletes during a 6-week training period. *Journal of Strength and Conditioning Research*, 25(5), 1360-1367.
- Milenkovski, J. (1999). *Relaciji I razlikananeikoikognitivni, specificnimotorickisposobnosti, konativnikarakteristiki, I situaciono-motorickoznaenjekajodbojkariteod 'play-off' i 'play-out' natprevaritenaMakedonija 1997-1998*. Doctoral dissertation, Skopje: Ss. Cyril and Methodius University, Faculty for physical culture.
- Miskin, M.A., Fellingham, G. W., & Florence, L. W. (2010). Skill Importance in women's volleyball. *Journal of Quantitative Analysis in Sport*, 6(2), 1-14.
- Pion, J., J. Fransen, D. Deprez, V. Segers, R. Vaeyens, R.M. Philippaerts & Lenoir, M. (2015). Stature and jumping height are required in female volleyball, but motor coordination is a key factor for future elite success. *Journal of Strength and Conditioning Research*, 29(6), 1480-1485.

- Rozin, P., Fallon, A.E., & Mandell, R. (2000). The estimation of the heritability of antropometric measurements and motor skills in volleyball. *Applied human science: Journal of physiological anthropology*, 22 (1), 1-7.
- Sayin, M. (2011). Movement and skill learning. Ankara: Sports Publisher and Bookstore.
- Sheppard, J., Newton, R. & McGuigan, M. (2007). The Effect of Accentuated Eccentric Load on Jump Kinetics in High-Performance Volleyball Players. *International Journal of Sport Science and Coaching*, 2(3), 267–273. doi:10.1260/174795407782233209
- Sheppard, J., Newton, R., & McGuigan, M. (2007). The Effect of Accentuated Eccentric Load on Jump Kinetics in High-Performance Volleyball Players. *International Journal of Sports Science & Coaching*, 2(3), 267–273. doi:10.1260/174795407782233209
- Smith, D. J., Roberts, D., & Watson, B. (1992). Physical, Physiological and Performance Differences Between Canadian National Team and Universiade Volleyball Players. *Journal of Sports Sciences*, 10, 131-133.
- Smith, D.J., Roberts, D. & Watson, B. (1992). Physical Physiological and Performance Differences Between Canadian National Team and Universiade Volleyball Players. *Journal of Sports Sciences*, 10.
- Stefan, K., Kunesch, E., Cohen, L., Beneche, R., Classen, J. (2000). Motor performance in female volleyball players aged 13-15. *Journal of Sport Science*, 23 (3), 72-84.
- Tambs, K., Mourn, T., Eaves, L., Neale, M., & Holmen, J. (2001). Anthropometric and motor abilities in female volleyball players. *American Journal of Sport and Science*, 3 (3), 267-275. 39.
- Thomas, P.Q., & Semmler, J.G. (2012). A comparison of motor structures in male and female volleyball players. *Journal of Sport and Health*, 36 (5), 26-34.
- Timmons, B.W., Naylor, P-J, Pfeiffer, K.A. (2007). Physical activity for preschool children—how much and how? *Applied Physiology, Nutrition, and Metabolism*, 32 (2), S122-S134.
- Uslu, S., Čaušević, D., Abazović, E., Mahmutović, Ifet, Mahmutović, Indira, Riza, B. (2021). The relationship between motor skills and technical skills specific to volleyball in adolescent volleyball players. *International Journal of Life Science and pharma Research*, 285-295.
- Wells, F. K., & Dillon, K. E. (2002). Motor performance in female volleyball players. *Research Quarterly. American Association for Health, Physical Education and Recreation*, 26 (1), 115-118.
- Williams, L. R. T., & Gross, J. B. (2008). Motor skill and performance. *Sport and science*, 29 (2), 127-136.
- World Health Organization. (2007). *AnthroPlus*. Retrieved August 15, 2020, from <https://www.who.int/>
- Zeqiri, L., Stojmanovska, S. D., & Georgiev, G. (2020). Body Composition of females in two age groups. *Research in Physical Education, Sport and Health*, 9, 133-138. doi:10.46733/pesh2090133z
- Ziv, G., & Lidor, R. (2010). Vertical jump in female and male volleyball players: a review of observational and experimental studies. *Scandinavian Journal of Medicine and Science in Sports*, 20, 556–567.