Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/rhb35w62

PHYSIOLOGICAL PARAMETERS OF MALE VOLLEYBALL PLAYERS OF DIFFERENT LEVEL: A COMPARATIVE STUDY

Dr. Mohammad Muzamil Shah[1*], Budru Nissa[2], Dr. Bilal Ahmad Malla[3], Dr. faisal Sualeh Hayyat[4]

[1*]Assistant professor, Department of Physical Education-Central University of Kashmir-India.
(email id: muzamilshah@cukashmir.ac.in)
[2]PhD Research Scholar- Department of Sports and Physical Education Indira Gandhi Technological and Medical Sciences University, Arunachal Pradesh
(email id: nissabudru@gmail.com)
[3]Physical Training instructor (Academic Arrangement)-College of Education-Srinagar J&K-India
(email id: bilalahadmalla@gmail.com)
[4]Physical Training instructor College of Education-Srinagar J&K-India
(faialhayyat007@gmail.com)

Abstract
The purpose of the study was to assess and compare selected physiological variables among male volleyball players of different level. For the purpose of the study sixty (N=60) professional volleyball players with age ranged from 18 to 22 year, were selected from the Shopian & Kulgam District of Kashmir valley. The selected players were divided into three groups i.e., beginner, intermediate and advanced on the basis of highest level of play. Physiological parameters basal metabolic rate (BMR), fat percentage, fat weight & lean body mass were selected as variables for the study. Descriptive statistics, one-way ANOVA, LSD post hoc test were employed. The result revealed that there was a significant difference in basal metabolic rate, fat percentage, fat weight & lean body mass between beginner, intermediate and advanced male volleyball players. It is concluded that BMR and lean body mass is higher in advanced than intermediate and beginner male volleyball players while fat percentage and fat weight is higher in beginner than intermediate and advanced male volleyball players.

Key words: Basal metabolic rate, fat percentage, fat weight & lean body mass.

Introduction

Volleyball is an intermittent sport that requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity (Franks et al., 1969; Hosler, et al., 1978). The high-intensity bouts of exercise, coupled with the total duration of the match (90 minutes), require players to have well-developed aerobic and anaerobic alactic energy systems (Häkkinen, 1993 & 19). Considerable demands are also placed on the neuromuscular system during the various sprints, jumps (blocking and spiking), and high-intensity court movement that occur repeatedly during competition (Häkkinen, 1993). As a result, volleyball players require well-developed speed, agility, upper-body and lower-body muscular power, and maximal aerobic power (V˙O2 max). The development of performance-enhancement training programs for female volleyball players requires volleyball coaches, strength and conditioning coaches, and other professionals who work with the

volleyball player (e.g., athletic trainers, physiotherapists, and physicians) to use empirical and practical knowledge from various sport-related domains, among them being exercise physiology and sports medicine. Relevant information on training-related issues, such as physical attributes (e.g., height, body mass, and fat-free mass), physiological attributes (e.g., aerobic profile, strength, vertical jump ability, and agility and speed), and on-court data (e.g., heart rate and blood lactate level), can be effectively implemented in volleyball programs, particularly in strength and conditioning programs specifically developed for the male volleyball player. Several studies have documented the physiological capacities of senior volleyball players, investigations of the physiological capacities of junior volleyball players are limited (Gabbett, 2005 & Gabbett et al., 2006).

Methodology:

The purpose of the study was to assess and compare selected physiological variables among male volleyball players of different level. For the purpose of the study sixty (N=60) professional volleyball players were selected from Shopian & Kulgam District of Kashmir valley. The selected players were divided into three groups i.e., beginner, intermediate and advanced on the basis of highest level of play. Those who have played up to district level were classified into beginner group; those who have played up to intercollege level were classified into intermediate group & those who have played up to National/interuniversity/state level were classified into advanced group. The age of selected subjects was ranging from 18 to 22 year. Physiological parameters basal metabolic rate, fat percentage, fat weight & lean body mass were selected as variables for the study. Basal metabolic rate was calculated by revised Harris-Benedict BMR equation for Men: (88.4 + 13.4 x weight) + (4.8 x height) – (5.68 x age).

Fat percentage was calculated using skin fold calliper to take the skin folds abdominal, triceps, thigh and suprailiac and Jackson and Pollock equation was used. The Jackson and pollock equation that was used to calculate fat percentage is as

% Body Fat = (0.29669 x sum of skinfolds) – (0.00043 x square of the sum of skinfolds) + (0.02963 x age) + 1.4072,

where the skinfold sites (measured in mm) are abdominal, triceps, thigh and suprailiac.

Fat weight was calculated from weight and fat percentage while lean body was calculated by subtracting the fat weight from total weight.

Descriptive statistics, one-way ANOVA, LSD post hoc test were applied to get the results.

Result and Analysis

Table 1: Descriptive statistics of basal metabolic rate of male volleyball players

Variables	Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Lower Bound		
Basal Metabolic Rate	Beginner	20	1482.5851	115.36980	25.79747	1428.5904	1536.5799	1300.12	1774.98
	Intermediate	20	1559.4360	67.31585	15.05228	1527.9312	1590.9407	1438.00	1692.28
	Advanced	20	1677.3931	65.03059	14.54128	1646.9578	1707.8284	1568.53	1801.28
	Total	60	1573.1381	116.76973	15.07491	1542.9732	1603.3029	1300.12	1801.28

The mean and standard deviation values of basal metabolic rate among beginner, intermediate and advanced male volley players is 1482.58±115.36, 1559.43±67.31 and1677.39±65.03 respectively.

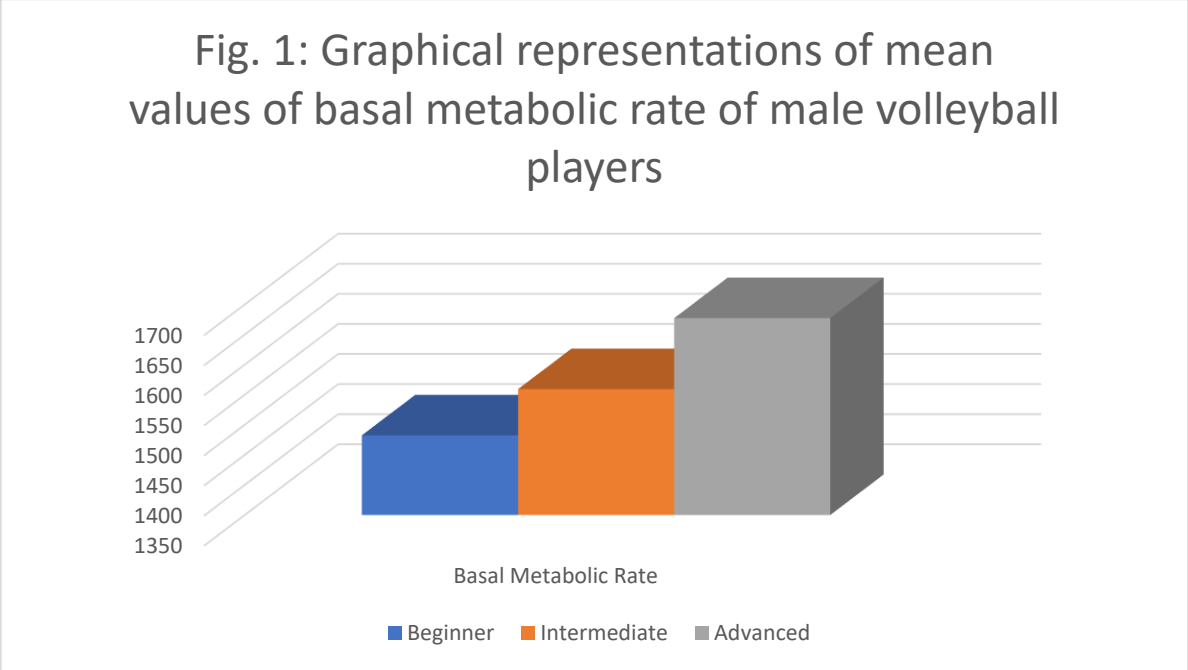

Table 2: One Way ANOVA of basal metabolic rate of male volleyball players

		Sum of Squares	df	Mean Square	F	Sig.
Basal Metabolic Rate	Between Groups	385133.814	2	192566.907	26.175	.001
Within Groups	Within Groups	419341.256	57	7356.864		
Total	Total	804475.070	59			

After applying a one-way ANOVA Table 2 revealed, results revealed that there were significant differences in basal metabolic rate between the three groups, $F(2, 57) = 26.175$, $p < 0.05$.

Table 3: Post Hoc Test (LSD) of basal metabolic rate of male volleyball players

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Lower Bound
Basal Metabolic rate	Beginner	Intermediate	-76.85080*	27.12354	.006	-131.1648	-22.5368
		Advanced	-194.80795*	27.12354	.001	-249.1219	-140.4940
	Intermediate	Advanced	-117.95715*	27.12354	.001	-172.2711	-63.6432

Table no. 3 displayed the LSD comparisons about the mean scores. The mean of basal metabolic rate of beginner was significantly lower than intermediate and advanced male volleyball players and the mean of intermediate was significantly lower than advanced male volleyball players.

Table 4: Descriptive statistics of fat percentage of male volleyball players

Variables	Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Lower Bound		
Fat Percentage	Beginner	20	12.0150	2.20078	.49211	10.9850	13.0450	9.00	16.44
	Intermediate	20	9.2373	1.37192	.30677	8.5952	9.8793	7.62	12.00
	Advanced	20	8.3720	.70190	.15695	8.0435	8.7005	7.62	10.01
	Total	60	9.8748	2.18645	.28227	9.3099	10.4396	7.62	16.44

The mean and standard deviation values of fat percentage among beginner, intermediate and advanced male volley players is 12.01±2.20, 9.23±1.37 and 8.37±0.701respectively.

Fig. 1: Graphical representations of mean values of fat percentage of male volleyball players

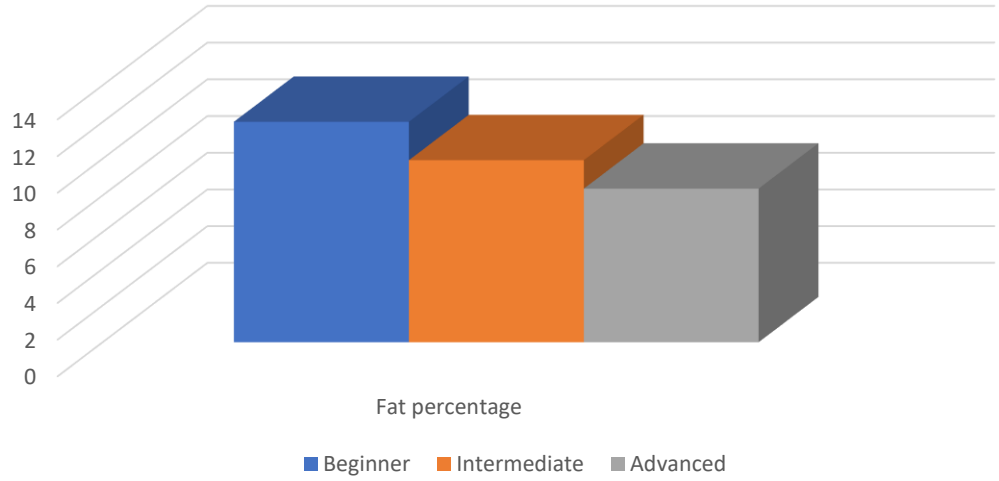

Table 5: One Way ANOVA of fat percentage of male volleyball players

		Sum of Squares	df	Mean Square	F	Sig.
Fat Percentage	Between Groups	144.907	2	72.453	30.112	.001
Within Groups	Within Groups	137.147	57	2.406		
Total	Total	282.05	59			

After applying a one-way ANOVA Table 5 revealed, results revealed that there were significant differences in fat percentage between the three groups, $F(2, 57) = 30.112$, $p < 0.05$.

Table 6: Post Hoc Test (LSD) of fat percentage of male volleyball players

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Lower Bound
Fat Percentage	Beginner	Intermediate	2.77775*	.49052	.001	1.7955	3.7600
		Advanced	3.64300*	.49052	.001	2.6608	4.6252
	Intermediate	Advanced	.86525	.49052	.043	-.1170	1.8475

The mean of fat percentage of beginner was significantly higher than intermediate and advanced volleyball players and the mean of intermediate was significantly higher than advanced male volleyball players.

Table 7: Descriptive statistics of fat weight of male volleyball players

Variables	Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Lower Bound		
Fat Weight	Beginner	20	6.8839	1.19296	.26675	6.3256	7.4422	4.00	9.00
	Intermediate	20	4.6267	.96144	.21498	4.1767	5.0766	3.05	6.02
	Advanced	20	3.5551	.57996	.12968	3.2836	3.8265	2.89	5.08
	Total	60	5.0219	1.67984	.21687	4.5879	5.4558	2.89	9.00

The mean and standard deviation values of fat weight among beginner, intermediate and advanced male volley players is 6.88±1.19, 4.62±0.96 and 3.55±0.57 respectively.

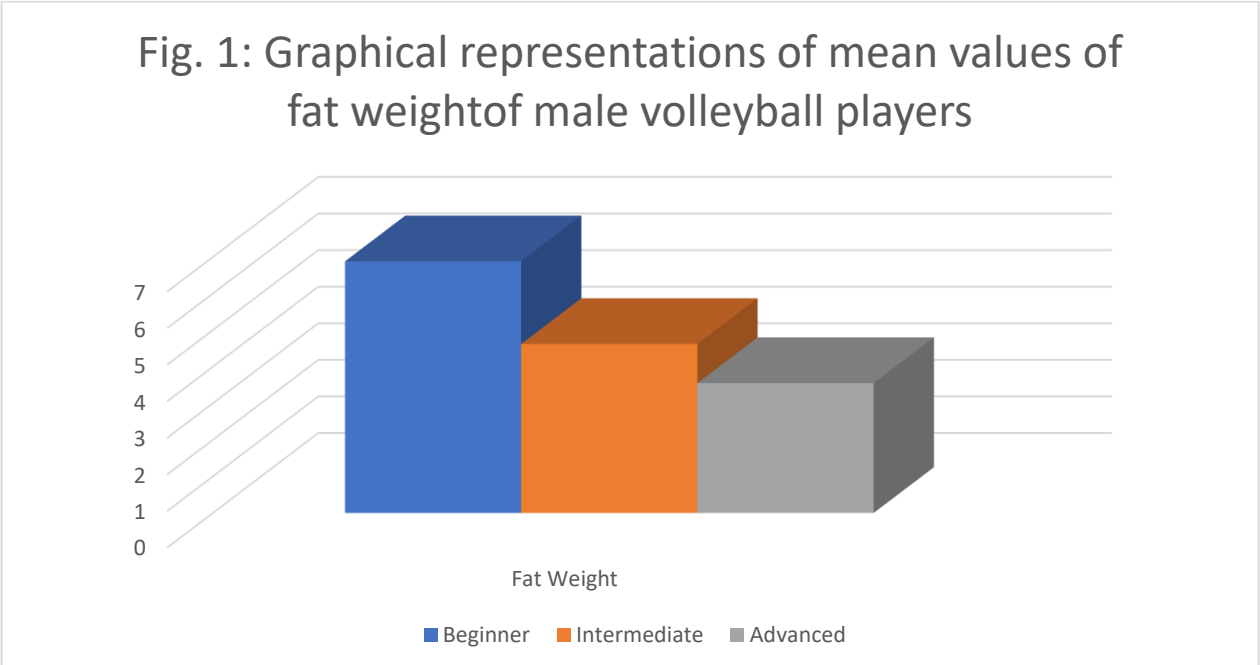

Table 8: One way ANOVA of fat weight of male volleyball players

		Sum of Squares	df	Mean Square	F	Sig.
Fat weight	Between Groups	115.496	2	57.748	64.550	.001
Within Groups	Within Groups	50.994	57	.895		
Total	Total	166.49	59			

After applying a one-way ANOVA Table 8 revealed, results revealed that there were significant differences in fat weight between the three groups, $F(2, 57) = 64.55$, $p < 0.05$.

Table 9: Post Hoc Test (LSD) of fat weight of male volleyball players

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Lower Bound
Fat Weight	Beginner	Intermediate	2.25722*	.29910	.001	1.6583	2.8562
		Advanced	3.32882*	.29910	.001	2.7299	3.9278
	Intermediate	Advanced	1.07159*	.29910	.001	.4726	1.6705

The mean of fat weight of beginner was significantly higher than intermediate and advanced and the mean of intermediate was significantly higher than advanced male volleyball players.

Table 10: Descriptive statistics of lean body mass of male volleyball players

Variables	Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Lower Bound		
Lean Body Mass	Beginner	20	36.0247	4.71105	1.05342	33.8198	38.2295	24.85	43.00
	Intermediate	20	37.6033	4.68704	1.04805	35.4097	39.7969	31.46	46.51
	Advanced	20	44.3659	3.49963	.78254	42.7280	46.0038	39.00	51.00
	Total	60	39.3313	5.61041	.72430	37.8820	40.7806	24.85	51.00

The mean and standard deviation values of lean body mass among beginner, intermediate and advanced male volley players is 36.02±4.71, 37.60±4.68 and 44.36±3.49 respectively.

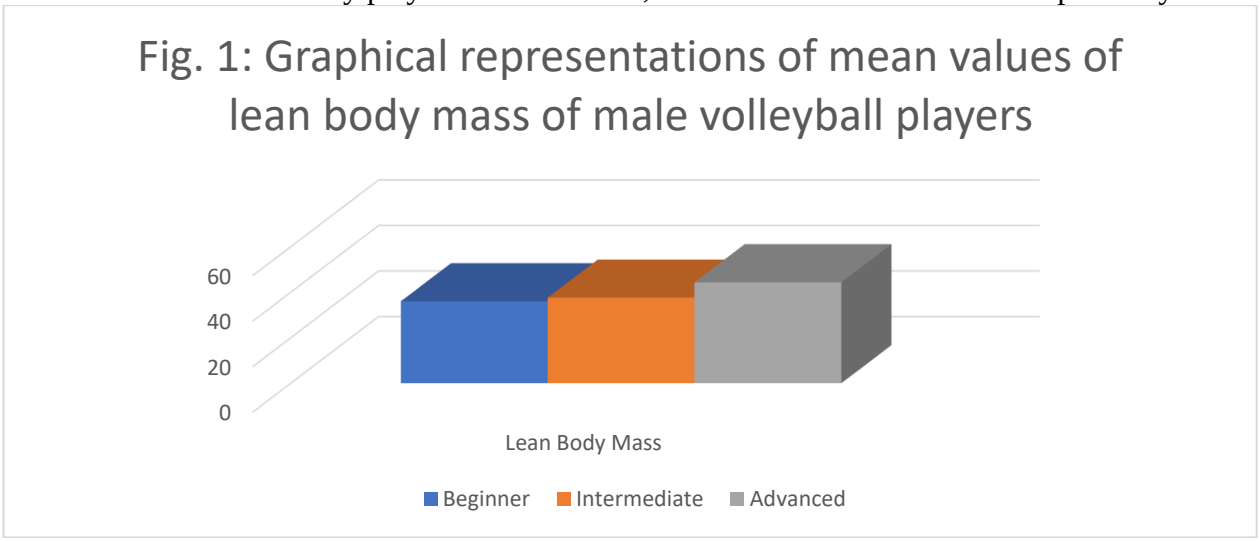

Table 11: One way ANOVA of lean body mass of male volleyball players

		Sum of Squares	df	Mean Square	F	Sig.
Lean Body mass	Between Groups	785.341	2	392.671	20.883	.001
Within Groups	Within Groups	1071.785	57	18.803		
Total	Total	1857.12	59			

After applying a one-way ANOVA Table 11 revealed, results revealed that there were significant differences in lean body mass between the three groups, $F(2, 57) = 20.88$, $p < 0.05$.

Table 12: Post Hoc Test (LSD) of lean body mass of male volleyball players

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Lower Bound
Lean Body Mass	Beginner	Intermediate	-1.57861	1.37125	.254	-4.3245	1.1673
		Advanced	-8.34123*	1.37125	.001	-11.0871	-5.5954
	Intermediate	Advanced	-6.76262*	1.37125	.001	-9.5085	-4.0167

The mean of lean body mass of beginner was not significantly different than intermediate and the mean of beginner was significantly lower than advanced male volleyball players and the mean od intermediate was significantly lower than advance male volleyball players.

Discussion

The mean of basal metabolic rate of beginner was significantly lower than intermediate and advanced male volleyball players and the mean of intermediate was significantly lower than advanced male volleyball players. The mean of fat percentage of beginner was significantly higher than intermediate and advanced volleyball players and the mean of intermediate was not significantly higher than advanced male volleyball players. The mean of fat weight of beginner was significantly higher than intermediate and advanced and the mean of intermediate was significantly higher than advanced male volleyball players. The mean of lean body mass of beginner was not significantly different than intermediate and the mean of beginner was significantly lower than advanced male volleyball players and the mean of intermediate was significantly lower than advance male volleyball players. Data confirms that both FFM and FM are significant contributors to BMR. When the effect of FM on BMR is removed, any association with leptin concentrations disappears, which suggests that previous links between circulating leptin concentrations and BMR occurred only because of inadequate control for the effects of FM (Johnstone et al., 2005). Anthanont & Jensen, (2016) study concluded that adults with low BMRs did not gain more weight than did adults with high BMRs, implying that habitual differences in food intake or activity counterbalance variations in BMR as a risk factor for weight gain in a typical Western population. Campa & Toselli, (2018) study resulted that the elite group showed a greater amount of fat-free mass (FFM) and total body water (TBW) and a lower fat mass (FM) than the subelite group ($P < .05$). In addition, the elite players were taller and heavier and had a higher FFM, FM, TBW, and body cellular mass than the low-level athletes ($P < .05$). Finally, the mean impedance vectors of the elite group significantly differed from those measured in the normal population and in the other 2 groups ($P < .05$). This study provides an original data set of body-composition and bioelectric impedance reference values of elite male volleyball players. The results might be useful for interpretation of individual bioimpedance vectors and for defining target regions for volleyball players.

Conclusions

Following conclusions are drawn from the current study:

1. There is significant difference in basal metabolic rate between beginner and intermediate male volleyball players. Thus, it is concluded that basal metabolic rate is higher in intermediate than beginner male volleyball players.
2. There is significant difference in basal metabolic rate between beginner and advanced male volleyball players. Thus, it is concluded that basal metabolic rate is higher in advanced than beginner male volleyball players.
3. There is significant difference in basal metabolic rate between intermediate and advanced male volleyball players. Thus, it is concluded that basal metabolic rate is higher in advanced than intermediate male volleyball players.
4. There is significant difference in fat percentage between beginner and intermediate male volleyball players. Thus, it is concluded that fat percentage is higher in beginner than intermediate male volleyball players.
5. There is significant difference in fat percentage between beginner and advanced male volleyball players. Thus, it is concluded that fat percentage is higher in beginner than advanced male volleyball players.
6. There is significant difference in fat percentage between intermediate and advanced male volleyball players. Thus, it is concluded that fat percentage is higher in intermediate than advanced male volleyball players.
7. There is significant difference in fat weight between beginner and intermediate male volleyball players. Thus, it is concluded that fat weight is higher in beginner than intermediate male volleyball players.
8. There is significant difference in fat weight between beginner and advanced male volleyball players. Thus, it is concluded that fat weight is higher in beginner than advanced male volleyball players.
9. There is significant difference in fat weight between intermediate and advanced male volleyball players. Thus, it is concluded that fat weight is higher in intermediate than advanced male volleyball players.
10. There is no significant difference in lean body mass between beginner and intermediate male volleyball players.
11. There is significant difference in lean body mass between beginner and advanced male volleyball players. Thus, it is concluded that lean body mass is higher in beginner than advanced male volleyball players.
12. There is significant difference in lean body mass between intermediate and advanced male volleyball players. Thus, it is concluded that lean body mass is higher in intermediate than advanced male volleyball players.

References:

1. Anthanont, P., & Jensen, M. D. (2016). Does basal metabolic rate predict weight gain?. *The American journal of clinical nutrition*, *104*(4), 959-963.
2. Campa, F., & Toselli, S. (2018). Bioimpedance vector analysis of elite, subelite, and low-level male volleyball players. *International Journal of Sports Physiology and Performance*, *13*(9), 1250-1253.
3. Franks, B. D., & Moore, G. C. (1969). Effects of calisthenics and volleyball on the AAHPER fitness test and volleyball skill. *Research Quarterly. American Association for Health, Physical Education and Recreation*, *40*(2), 288-292.
4. Gabbett, T. J. (2005). Changes in physiological and anthropometric characteristics of rugby league players during a competitive season. *The Journal of Strength & Conditioning Research*, *19*(2), 400-408.
5. Gabbett, T., Georgieff, B., Anderson, S., Cotton, B., Savovic, D., & Nicholson, L. (2006). Changes in skill and physical fitness following training in talent-identified volleyball players. *The Journal of Strength & Conditioning Research*, *20*(1), 29-35.

6. Häkkinen, K. (1993). Changes in physical fitness profile in female volleyball players during the competitive season. *The Journal of sports medicine and physical fitness*, *33*(3), 223-232.
7. Hosler, W. W., Morrow Jr, J. R., & Morrow Jr, J. R. (1978). Strength, anthropometric, and speed characteristics of college women volleyball players. *Research Quarterly. American Alliance for Health, Physical Education and Recreation*, *49*(3), 385-388.
8. Johnstone, A. M., Murison, S. D., Duncan, J. S., Rance, K. A., & Speakman, J. R. (2005). Factors influencing variation in basal metabolic rate include fat-free mass, fat mass, age, and circulating thyroxine but not sex, circulating leptin, or triiodothyronine. *The American journal of clinical nutrition*, *82*(5), 941-948.