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Research Article

Effect of Plyometric Model on Increasing Volleyball Jumping Power Based on Anthropometric Ratio

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Abstract

The paper is a reflection of observations made from the study done to know the intricacies of different alcoholic drinks with a focus on "Wine" for positioning it in the preference list of consumers of Alcoholic Beverages - globally, going by the choices of people in different geographical, climatic and the cultural locations. For some, Wine is the most liked drink and for some it is alright to have, but then the "Why and Why not" of individual preferences or otherwise is a matter of personal indulgence. The paper throws light on those observations made about Wine. The positioning of Wine in the consumer‟s preference list of Alcoholic beverages would naturally be one that it deserves. The paper also provides a glimpse of what „Wine‟ is doing in the market in general to work and gain its due share among those competing with one another, enthusing the lovers of Alcoholic beverages.

Keywords: *Wine, Beer, Spirits, Alcoholic beverages*

Introduction

Every sport requires a thorough physical condition."Development of a comprehensive physical condition is very important, therefore without good physical condition athletes will not be able to follow the exercises perfectly"(Garnett, Patricios, & Cobbing, 2021). To have an excellent physical condition, training is required, the exercise must be carried out properly, correctly, programmed and continuously so that the athlete has excellent physical condition and will certainly help in achieving maximum performance(Kaur, Singh, Arya, & Mittal, 2020).

During exercise, every athlete will experience many reactions to experiences that are felt repeatedly"(Aloui et al., 2021). There are running, lifting weights, jumping and others. These jumping exercises are called plyometrics(Slimani, Chamari, Miarka, Del Vecchio, & Chéour, 2016). "Plyometrics is one way and is a form of exercise to achieve explosive power for all sports activities. It is a special exercise that trains the muscles to increase maximum strength faster, plyometrics will make athlete stronger and faster(Eraslan et al., 2021, Susanto, Siswantoyo, Prasetyo, & Putranta, 2021).

Basically, plyometrics is a movement of sudden muscle stretching stimulation so that a stronger contraction occurs. Explosive power and strength of muscle contraction is a reflection of increased neuromuscular functional adaptation. The muscles consist of two types of muscle fibers. Fibers with slow contractions are red and those with fast contractions are white (Nossek, 1982: 41). This type of white fiber produces rapid movements and lasts for a short period of time. For plyometrics more suitable white muscle type. Plyometrics has a very explosive character, the muscles are first stretched during the eccentric type of movement, before the muscle is intensively contracted with a positive acceleration(Ozen, Atar, & Koc, 2020)

Related to the above, volleyball is a sport that requires leg muscle explosive power (jumping power). To be able to do smash and block well, you need a high jump, muscle explosive power is the ability of muscles to perform explosive movements which are influenced by the combination of strength and speed shown by children when jumping, hitting, throwing and other explosive movements that require full power(Fuchs et al., 2021). To achieve a movement with a fast start or maximum lift when jumping, one of the conditions for doing this contraction requires power(Arumugam & Venkatesh, 2019). This means that if an athlete wants to have a maximum jump and has the ability to make sudden movements quickly, a force is needed, known as power(Haugen, Breitschädel, Wiig, & Seiler, 2021)

Why this research in necessary? Based on the observations done, in the second semester male students majoring in PJS in volleyball subjects, there were physical abilities that were still not good, especially the ability to jump when doing smash and block. There are still many students who are not good at jumping. Less good means that the jump made is relatively low, as can be seen from the reach of the hand that passes through the white band of the net. So, to hit (smash) it is not uncommon for the ball to hit the net. So, it can be said that in doing smash and block it is still far from what is expected. In addition to physical factors, one of which is power that can support achievement, there are also other factors that influence the body proportion (anthropometric ratio) between height and leg length. In volleyball, body proportions are needed that can support the ability to make good jumps, because jumping is a very influential thing in getting grades, in the sense of the word, in volleyball a good jump can produce high performance, in addition to being influenced by other factors. -other factors.

Many research problems can be worked on in this field, but in this study, the research is limited as stated in the title. The research problem formulated here is the boundary of the research area to be carried out.

The research problems are the following:

1. Is there any difference between Donald A. Chu's circuit plyometrics model and circuit plyometrics based on vertical jump motion analysis on increasing jumping power?
2. Is there any difference in the increase in jumping power between high and low anthropometric ratios?
3. Is there any interaction effect between circuit plyometrics model and anthropometric ratio on increasing jumping power?

Research Methodology

This study was an experimental research with quantitative method consisting on three variables, namely the manipulative independent variable (exercise model), the attributive independent variable (anthropometric ratio) and the dependent variable (jumping power). The research design was 2x2 factorial. The research sample was 36 athletes taken by random sampling. Anthropometric ratio data was obtained by measuring body height and leg length, while jumping power was measured by vertical jump test. The data analysis technique used two-way ANOVA.

The Research Procedure

The research followed the below design

Table 1: 2 X 2. Factorial Research Design

Anthropometric Ratio (B)	**Plyometrics Circuit Models (A)**	
	Donald A. Chu (A1)	**Vertical Jump Motion Analysis (A2)**
Height (B1)	A1B1	A2B1
Low (B2)	A1B2	A2B2
Jump Power Boost		

In this study the instruments used are as follows:

1. Measurement of jumping power using the vertical jump test(Ruffieux, Wälchli, Kim, & Taube, 2020). "The vertical jump test aims to measure the explosive power of the leg muscles (jumping power)". The results of the vertical jump are then calculated using the Lewis Nomogram formula (Winarno et al, 1997: 124):

$$P = \sqrt{4{,}9}(\text{weight})\sqrt{D}$$

Note: P = *Power*

*Weigh*t= weight

D"= jump height (the difference between the achieved heights without jumps with reach heights using jumps).

2. Measurement of the ratio of height and leg length using a stadiometer.

Plyometrics circuit model based on vertical jump motion analysis is a plyometrics exercise that is taken based on motion analysis or muscles that work in accordance with the movement when doing a vertical jump. So, when doing vertical jumps the results will be better, because the working muscles are trained to be able to do this.

Donald A. Chu's circuit plyometrics model is a form of exercise taken from the book by Donald A. Chu. In this form of exercise, it is actually more focused on being able to improve physical abilities in playing volleyball, especially jumping. So, the exercise is not necessarily good at doing vertical jumps when compared to exercises that are adapted to the vertical jump itself.

Result

The research hypothesis testing was carried out based on the results of data analysis and the interpretation of the analysis of variance. The Newman-Keuls range test was taken as a step-by-step average test after Anova. Regarding the results of the analysis of variance and the Newman-Keuls range test, there are several hypotheses that must be tested. The order of testing is adjusted to the order of the hypotheses formulated in chapter II. The results of data analysis, which are needed for hypothesis testing are as follows:

Table2: Summary of Average Jumping Power Ability Based on the Use of Exercise Models and Anthropometric Ratio Level

Variable / Average Power Ability Jump	A1		A2	
	B1	**B2**	**B1**	**B2**
Preliminary Test Results	101.5898	89.03817	101.0369	94.71771
Final Test Results	104.7712	91.25255	104.6096	97.16646
Enhancement	3.1814	2,21438	3.5727	2,44875

Information :
A1 = Model circuit plyometrics Donald A. Chu
A2 = Model *circuit plyometrics* based on vertical jump motion analysis
B1 = group of students who have the ratio *anthropometric* tall
B_2= The group of students who have a low anthropometric ratio

Table3: Summary of Two-Factor Analysis of Variance

Source / Variance	dk	JK	RJK	Fo	Ft
Average					
Treatment	1	293.29	293.29		
A	1	9.84	9.84	9.79	4.15
B	1	0.88	0.88	0.88	4.15
AB	1	0.06	0.06	0.06	4.15
Mistake	32	32.15	1.00		
Total	36	336.21			

Table4: Summary of Newman-Keuls Range Test Results After Analysis of Variance

KP		A1B2	A2B2	A1B1	A2B1	RST
	Average	2,21438	2,44875	3.18136	3.57270	
A1B2	2,21438	-	0.234373	**0.966987**	**1.358324** *	**0.966**
A2B2	2,44875		-	0.732614	1.123951	1,166
A1B1	3.18136			-	0.391337	1,286
A2B1	3.57270				-	

Note: Those marked with * are significant on P □ 0.05.
Based on the results of the data analysis above, the following hypothesis testing can be carried out:

1. Test I

The results of the research on data testing carried that there is is a significant difference in the effect between Donald A. Chu's circuit plyometrics model and circuit plyometrics model based on vertical jump motion analysis on increasing jumping power. This is evidenced by the value of $F_{count} = 9.79 > F_{table} = 4.15$. Based on the result the first hypothesis has been confirmed.

2. Test II

The results of the research on data testing carried out that there is no significant difference in increasing jumping power between students who have high anthropometric ratios and low anthropometric ratios. This is evidenced by the value of $F_{count} = 0.88 < F_{table} = 4.15$. Based on the above result the second hypothesis has been nuanced.

3. Test III

The results of the research on data testing carried out that there is no significant interaction effect between the circuit plyometrics model and the anthropometric ratio on the increase in jumping power. This is evidenced by the value of $F_{count} = 0.06 < F_{table} = 4.15$. The above result explained that the third hypothesis has been unconfirmed.

Discussion

The result showed that the subjects who received the circuit plyometrics model based on the analysis of the vertical jump motion have a better increase in jumping power compared to the group of students who received the Donald A. Chu circuit plyometrics model. There is a significant difference between Donald A. Chu's circuit plyometrics model and circuit plyometrics based on vertical jump motion analysis on increasing jumping power. Plyometrics is one way and is a form of exercise to achieve explosive power for all sports activities(Pascal, 2020)". Plyometric is a special exercise that trains the muscles to increase maximum strength faster(Ramirez-Campillo et al., 2020). The plyometric concept is "The best way to develop the maximum explosive power of certain muscles is to stretch (lengthen) the muscles first before contracting (shortening) these muscles explosively(Ben Ayed, Ben Saad, Ali Hammami, & Latiri, 2020).

The result showed that there is no significant difference in increasing jumping power between high and low anthropometric ratios. There are several reasons that can be put forward why the second hypothesis does not have a significant increase: (a) the research only distinguished the anthropometric ratio between leg length divided by height. There is no in-depth study of the differences in anthropometric ratios between the length of the soles of the feet, lower legs, upper limbs and trunk lengths, which may affect a person's ability to improve jumping ability.(b) the use of limited sampling should limit the great deep of the research. **Factors Affecting Power**

Mitchell explains that the determinants of power are:(Mitchell, Holding, & Greig, 2020)

a. Many or less types of white muscle fibrils from athletes
b. Muscle strength and muscle speed
c. Stimulation time is concretely limited in length
d. Harmonious movement coordination
e. It depends on the amount of chemical in the muscle (ATP).

In addition, the research showed that there is no significant interaction effect between circuit plyometrics model and anthropometric ratio to increase jumping power. This can be due to the limited number of samples, plus the ability of researchers to control each student activity or sample outside of the research can not be done completely. Circuit training is an exercise program consisting of several stations and at each station an athlete performs a predetermined type of exercise (Jes, Caravaca, Mart, & Rubio-arias, 2021), While plyometrics is one way and is a form of exercise to achieve explosive power for all sports activities (Nugroho, Nasrulloh, Karyono, & Dwihandaka, 2021, Hermassi, Laudner, & Schwesig, 2020)

In this study, the circuit plyometrics model used is divided into two, namely Donald A. Chu's circuit plyometrics model and circuit plyometrics based on vertical jump motion analysis. Donald A. Chu's circuit plyometrics model is a form of plyometrics training specifically to improve jumping power in playing volleyball taken from the book Jumping into Plyometrics by Chu (1998: 166). Circuit plyometrics model based on vertical jump motion analysis is a form of plyometrics obtained based on the same muscles used in performing vertical jump movements.

Conclusion

Based on the result found above it can be conclude that the two training models, both Donald A. Chu's circuit plyometrics model and circuit plyometrics based on vertical jump motion analysis can be given in training, especially in increasing jumping ability in volleyball, but to obtain more optimal results. In improving jumping power, circuit plyometrics model based on vertical jump motion analysis is better given than Donald A. Chu's circuit plyometrics model. The goodness of circuit plyometrics model based on vertical jump motion analysis can be used as a solution for teachers and trainers in an effort to improve jumping ability.

Suggestion

Other researchers who will conduct research similar to this study can use repeat research with a larger number of samples in the study The research period is quite long and the main thing is the need to control the variables that can affect the increase in jumping power both in general and specifically.

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