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The Development of Talent Scouting for Volleyball Athletes of North Sumatra Students Based on Anthropometric Ratio

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Abstract. This study aimed to obtain a more complete information, enable and facilitate to conduct observational research on the description of the ideal athletes' specifications based on the anthropometric ratio. The final product of this study was a manual book of volleyball athlete talent scouting based on anthropometric ratios. The results showed that the talent scouting manual for volleyball athletes based on anthropometric ratios was very appropriate. These results were obtained from the validation results from: a) volleyball experts with a result of 95% or very appropriate; b) measurement test experts with a result of 93% or very appropriate; c) small group trial with a result of 81% or very appropriate; d) large group trial with a result of 94% or very appropriate. The talent scouting manual book for volleyball athletes based on anthropometric ratios is very suitable to be used as a media to find prospective volleyball athletes.

Keywords: Talent Scouting, Anthropometric Ratio

1 Introduction

⁸ The purpose of the volleyball game is to pass the ball over the net so that it can fall to the floor of the opponent's court and ¹³ to prevent the same effort from the opponent¹. In the volleyball game, in order to do it properly and correctly, a player must be able to master the basic techniques before playing volleyball. Technique is a way of doing or implementing something to achieve certain goals efficiently and effectively². Basic techniques of volleyball according to the systematic are: service, passing, set-up, smash and block³.

¹ PP. PBVSI. Peraturan Permainan Bola Voli. Jakarta : KONI, (2005).

² PP. PBVSI. Pelatihan Bola Voli di Indonesia. Jakarta : KONI, (1995).

³ Sudirman. Petunjuk Umum Melatih Bolavoli. Medan: Unimed, (2003).

In volleyball, body proportions are needed that can support the ability to make good jumps, because jumping is a very influential thing in getting score, in another word, a good jump in volleyball can produce high performance, but it also can be influenced by other factors. Anthropometric ratio is a comparison of body sizes. Anthropometric ratio can be defined as a further measurement of the external parts of the body⁴ [4]. Anthropometric measurements include measurements of body height, body length, arm length, leg length, upper leg length, lower leg length, and foot length.

The ideal body shape according to the sport being studied is one of the conditions that can affect the achievement of sports achievement. One of the aspects to get achievement in sports is the biological aspect which includes the structure and posture of the body, namely: 1) height and leg length measurements, 2) the size, width and weight, 3) somatotype (body shape)⁵.

Based on the explanation above, the size of the height and length of the legs and other parts is the aspect that is very dominant in determining a person's ability in volleyball. It is related to a person's ability to be able to make a maximum jump. Actually, the anthropometric ratios that are very decisive or related to jumping power are the length of the soles of the feet, lower legs, upper limbs, arm length and body length. At the beginning of the jump, the weight of the body or upper body is lifted by the upper limbs, followed by the lower legs and continued with the soles of the feet which is then ended with the push of the toes. All these movements must be well coordinated to produce a maximum jump. A well-developed body coordination will result a good jumping ability as well⁶.

All of the explanation above can work well if the anthropometric ratio is monitored from an early age. So talent scouting plays an important role, and really needs to be done. There are several steps that must be followed to prepare athletes⁷. The stages are:

1. Looking for talented athletes;
2. Selecting prospective athletes at young ages;
3. Monitoring the athlete candidates continuously and regularly;
4. Helping prospective athletes to achieve the highest performance.

Talent scouting is an effort that is carried out systematically to identify someone who has potential in sports, so that it is estimated that the person will succeed in training and can achieve the highest performance⁸. Another definition of talent scouting is to be an effort made to estimate with a high probability the chance of someone who is talented in achievement sports to be able to succeed in doing an exercise program to be able to achieve the highest performance⁹.

Talent scouting instruments must be specific and adapted to each sport, the development of which is done by using various approaches. In this case, one of the approaches used is a volleyball talent scouting test in terms of anthropometric ratios.

⁴ Verducci, F. M. Measurement Concepts in Physical Education. Missouri: C.V Mosby Company, (1990).

⁵ Sajoto, M. Pengembangan dan Pembinaan Kekuatan Kondisi Fisik Dalam Olahraga. Jakarta: Dahara Prize, (1988).

⁶ Sriyanto. Perkembangan dan Belajar Gerak. Jakarta: Depdikbud, (1994).

⁷ Bompa, T. O. Theory and Methodology of Training. Dubuque: Hunt Publishing, (2009).

⁸ Mutohir, Toho Cholik. Pedoman Mekanisme Koordinasi Pembinaan Olahraga, Kesegaran Jasmani dan Kelembagaan Olahraga. Jakarta: Direktorat Jenderal Olahraga, Departemen Pendidikan Nasional, (2002).

⁹ Menpora. Pemanduan Bakat Olahraga. Jakarta: Depdiknas, (1999).

2 Research Method

The research design used in this research was research and development method. Research and development methods are research methods used to produce certain products and test the effectiveness of the products^{10,11}. The subjects used in this study were 18 junior volleyball athletes from Deli Serdang regency. The research procedures used can be seen in the image below:

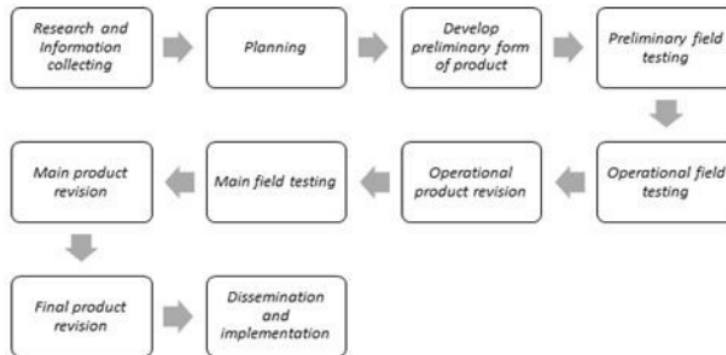


Fig. 1. Research and Development Method (R&D Method)

3 Research Result and Discussion

3.1 Research Results

From the needs analysis that have been done on volleyball athletes at Deli Serdang regency, in this case, junior male athletes, the information was obtained that 100% of junior male athletes did the training according to a predetermined schedule, 100% of coaches provided technical training materials according to the program that has been made, 73.3% of coaches felt that improving the ability of junior athletes who were currently trained has not been effective in achieving training goals, 100% of coaches answered that they needed talent scouting assistance based on anthropometric ratios to get athletes who were trained to achieve national and international achievements¹⁶.

From the needs analysis, it can be concluded that the idea of this research is the need for a talent scouting manual book based on anthropometric ratios to get prospective volleyball athletes who can get achievements at national and international levels. With the media in talent scouting manual book based on anthropometric ratios, it will make it easier to achieve goals more effectively and efficiently.

¹⁸ Agiyono. Metode Penelitian & Pengembangan R&D. Bandung: Alfabeta, (2017).

¹⁰ Sajoto, M. Pengembangan dan Pembinaan Kekuatan Kondisi Fisik Dalam Olahraga. Jakarta: Dahara Prize, (1988).

3.1.1 Media and Material Experts Test

The first test was done after the initial design of book media was observed, correlated, and declared worthy to be tested by the experts, both material experts, and also test and measurement experts. The evaluation was done to improve and perfect the book media that has been made.

Table 1. The Data Results of Material Expert "Talent Scouting Manual Book Based on Anthropometric Ratios"

Rated Aspects	Score Gained	Maximum Score	Percentage (%)	Category
Product suitability with the needs of students/athletes and teachers/coaches	23	24	96%	Very Appropriate
Product suitability with Talent Scouting goals	19	20	95%	Very Appropriate
Total	42	44	95%	Very Appropriate

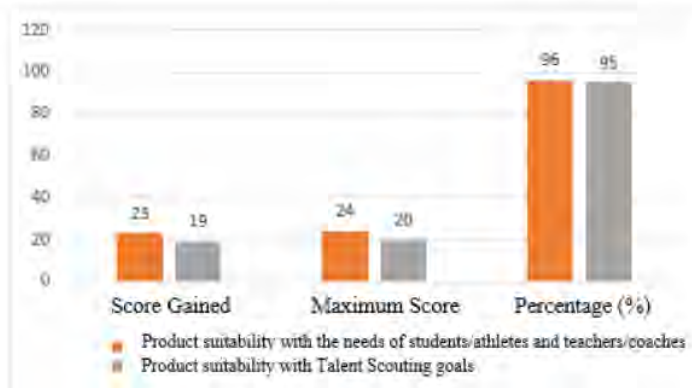
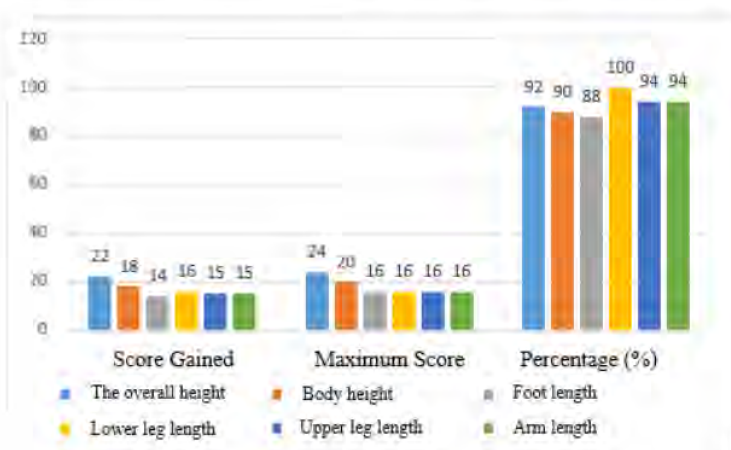


Fig. 2. The Data Result of Material Expert

The data obtained from the material expert validator was 95%, thus it was stated that "the development of talent scouting for volleyball athletes from North Sumatra students in terms of anthropometric ratios" which was made from the aspect of needs, it was obtained an assessment of the "Very Appropriate" category.

Table 2. The Data Results of Test and Measurement Expert "Talent Scouting Manual Book Based on Anthropometric Ratios"

No	Rated Aspects	Score Gained	Maximum Score	Percentage (%)	Category
1	The overall height	22	24	92%	Very Appropriate
2	Body height	18	20	90%	Very Appropriate
3	Foot length	14	16	88%	Very Appropriate
4	Lower leg length	16	16	100%	Very Appropriate
5	Upper leg length	15	16	94%	Very Appropriate
6	Arm length	15	16	94%	Very Appropriate
	Total	100	108	93%	Very Appropriate



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Fig. 3. The Data Result of Test and Measurement Expert

The data obtained from the test and measurement expert validators was 93%, thus it was stated that "the development of talent scouting for volleyball athletes of North Sumatra students in terms of anthropometric ratios" which was made from the aspect of needs, it was obtained an assessment of the "Very Appropriate" category.

3.1.2 Respondent Testing of Student Volleyball Athletes

3.1.2.1 Small-Scale Testing

The questionnaire results of the respondents or volleyball athletes regarding "talent scouting volleyball athletes of North Sumatra students in terms of anthropometric ratios" indicated that for the assessment of overall height aspect with the result of 87.5% which was categorized as "Very Appropriate", the assessment of body height aspect with the result of 90.5% in "Very Appropriate" category, the assessment of foot length aspect with the result of 84.3% in "Very Appropriate" category, the assessment of lower leg length aspect with the result of 84.3% in "Very Appropriate" category, the assessment of upper leg length aspect with the result of 84.3% in "Very Appropriate" category, the assessment of arm length aspect with the result of 84.3% in "Very Appropriate" category. The total assessment of the research feasibility test of "talent scouting volleyball athletes of North Sumatra students in terms of anthropometric ratios" according to respondents questionnaire was 92.5% and was categorized as "Very Appropriate" which indicated that the media in a manual book form for developing talent scouting of volleyball athletes was very feasible to be tested on the next stage after product revision.

The data below was a small-scale testing which was conducted on 6 respondents of volleyball athletes of North Sumatra students.

Table 3. The Questionnaire Results of the Small-Scale Testing Conducted at Lubuk Pakam Sports Arena

No.	Rated Aspects	Score Gained	Maximum Score	Percentage (%)	Category
	The overall				Very Appropriate
1	height	117	144	81%	
2	Body height	94	120	78%	Very Appropriate
3	Foot length	76	96	79%	Very Appropriate
4	Lower leg length	80	96	83%	Very Appropriate
5	Upper leg length	79	96	82%	Very Appropriate
6	Arm length	79	96	82%	Very Appropriate
	Total	525	648	81%	Very Appropriate

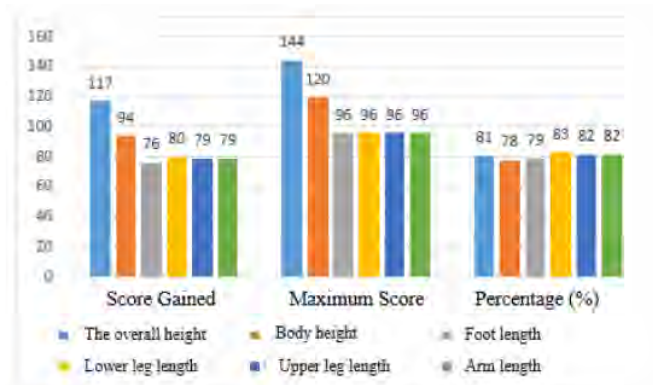


Fig. 4. The Questionnaire Results of the Small-Scale Testing

3.1.2.2 Large-Scale Testing

The data below was a large-scale testing which was conducted on 12 respondents of volleyball athletes of North Sumatra students.

Table 4. The Questionnaire Results of the Large-Scale Testing Conducted at Lubuk Pakam Sports Arena

No.	Rated Aspects	Score Gained	Maximum Score	Percentage (%)	Category
1	The overall height	263	288	91%	Very Appropriate
2	Body height	227	240	95%	Very Appropriate
3	Foot length	181	192	94%	Very Appropriate
4	Lower leg length	179	192	93%	Very Appropriate
5	Upper leg length	179	192	93%	Very Appropriate
6	Arm length	188	192	98%	Very Appropriate
	Total	1217	1296	94%	Very Appropriate

The data below was a large-scale testing which was conducted on 12 respondents of volleyball athletes of North Sumatra students. The questionnaire results of the respondents or volleyball athletes regarding to "talent scouting volleyball athletes of North Sumatra students in terms of anthropometric ratios" indicated that for the assessment of overall height aspect with the result of 91% which was categorized as "Very Appropriate", the assessment of body height aspect with the result of 95% which was categorized as "Very Appropriate", the assessment of foot length aspect with the result of 94% which was categorized as "Very Appropriate", the assessment of lower leg length aspect with the result of 93% which was categorized as "Very Appropriate", the assessment of upper leg length aspect with the result of 93% which was categorized as "Very Appropriate", and the assessment of arm length aspect with the result of 98% which was categorized as "Very Suitable" category.

The total assessment of the research feasibility test of "talent scouting volleyball athletes of North Sumatra students in terms of anthropometric ratios in terms of anthropometric ratios" according to respondents was 94% which was categorized as "Very Appropriate" which indicated that the media in manual book form for developing talent scouting of volleyball athletes is very feasible to use in finding the candidates of volleyball athletes/talent scouting based on anthropometric ratios.

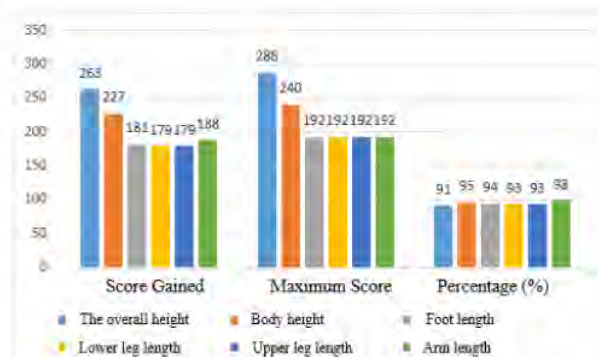


Fig. 5. The Questionnaire Results of the Large-Scale Testing

Based on the data obtained in this study, the data analysis was done carefully and thoroughly with an analysis of the data obtained, which was revealed the following results. (a) Based on the notes of the material experts as well as the test and measurement experts, it was decided to make a revision, namely changing the measurement method for the foot length. (b) After doing many validation and revision stages, in this product validation, it was declared as feasible and it was allowed to be done in a small-scale testing stage on 6 respondents of volleyball athletes of North Sumatra students, there were no any shortages so that a large-scale testing was continued on 12 respondents of volleyball athletes of North Sumatra students. (c) Based on the small-scale and large-scale testings, the test results were in the "Highly Qualified" category. The data results obtained were interpreted according to predetermined categories. The categories used in this development research were divided into several parts, namely the value of 0% - 20% was categorized as very inappropriate, 21%-40% was categorized as not feasible, 41%-60% was quite feasible, 61% -80% was categorized as feasible, and 81 -100% was categorized as very feasible.

3.2 Research Discussion

The manual book for talent scouting of volleyball athletes of North Sumatra students in terms of anthropometric ratios was designed and produced as an initial product for potential volleyball athletes based on anthropometric ratios. The manufacturing process went through research and manufacturing procedures. Through some planning, production, and evaluation, the product was made by the assistance of people who mastered the material and measurement

tests. After the initial product was made, it was needed to go through the expert validation and to be tested on volleyball athletes of North Sumatra students. The next stage of this research was done with the small-scale and large-scale testing.

The quality of "talent scouting for volleyball athletes of North Sumatran students based on anthropometric ratios in guide book form" was categorized "Very Appropriate". This statement can be proven from the analysis results of two experts, both material experts, as well as test and measurement experts, and it was also done in small and large scale testings. Sports teachers and coaches are very happy and enthusiastic about this product because they can identify prospective athletes to be fostered based on anthropometric ratio considerations, who are most likely to become professional volleyball athletes. This product may be distributed to other media. The test results can be explained in the following discussion.

3.2.1 Material Experts Testing

The results of material expert validation were 95%, thus stating that the media of a talent scouting manual book for volleyball athletes of North Sumatra students based on anthropometric ratios was developed from the aspect of needs assessment in "Very Appropriate" category. This showed that the talent scouting manual book for volleyball athletes was appropriate to be used as a guide for selecting prospective volleyball athletes in the future.

3.2.2 Test and Measurement Experts Testing

The data results from the test and measurement experts validators was 93%, thus it was stated that the talent scouting manual book for volleyball athletes of North Sumatran students based on anthropometric ratios was developed from the aspect of needs in "Very Appropriate" category which showed that the manual book deserves to be used as a guide for selecting prospective volleyball athletes in the future.

3.2.2.1 Small-Scale Testing

The questionnaire results of the respondents or volleyball athletes regarding "talent scouting for volleyball athletes of North Sumatra students in terms of anthropometric ratios" indicated that for the assessment of overall height aspect with the result of 87.5% which was categorized as "Very Appropriate", the assessment of body height aspect with the result of 90.5% in "Very Appropriate" category, the assessment of foot length aspect with the result of 84.3% in "Very Appropriate" category, the assessment of lower leg length aspect with the result of 84.3% in "Very Appropriate" category, the assessment of upper leg length aspect with the result of 84.3% in "Very Appropriate" category, the assessment of arm length aspect with the result of 84.3% in "Very Appropriate" category. The total assessment of the research feasibility test of "talent scouting volleyball athletes of North Sumatra students in terms of anthropometric ratios" according to respondents questionnaire was 92.5% and was categorized as "Very Appropriate" which indicated that a manual book media for developing talent scouting of volleyball athletes was very feasible to be used for selecting prospective volleyball athletes in the future.

3.2.2.2 Large-Scale Testing

The questionnaire results of the respondents or volleyball athletes regarding to "talent scouting for volleyball athletes of North Sumatra students in terms of anthropometric ratios" indicated that for the assessment of overall height aspect with the result of 91% which was categorized as "Very Appropriate", the assessment of body height aspect with the result of 95% which was categorized as "Very Appropriate", the assessment of foot length aspect with the result of 94% which was categorized as "Very Appropriate", the assessment of lower leg length aspect with the result of 93% which was categorized as "Very Appropriate", the assessment of upper leg length aspect with the result of 93% which was categorized as "Very Appropriate", and the assessment of arm length aspect with the result of 98% which was categorized as "Very Suitable" category. The total assessment of the research feasibility test of "talent scouting for volleyball athletes of North Sumatra students based on anthropometric ratios" according to respondents was 94% categorized as "Very Appropriate" which indicated that a manual book media for developing talent scouting for volleyball athletes was very feasible to use in finding volleyball athletes/talent scouting athletes based on anthropometric ratios in the future.

Each sport has different characteristics, for each sport requires a suitability comparison or balance of body types. Achievement is the main goal for every player in every sport. Each sport has a different area and pattern of play, so players must be adapted to their body type to be able to compete on the field and be able to play optimally.¹

The ideal body shape according to the sport being studied is one of the conditions that can affect the achievement of sports achievement. One of the aspects to achieve achievement in sports is the biological aspect which includes the structure and posture of the body, namely: 1) height and leg length measurements, 2) large size, width and weight, 3) somatotype (body shape)¹².

Basically, overall height, athletic body shape and good muscles can support the athlete's appearance to get achievements and in general, athletic people are accompanied by ideal limbs (tall people usually have long arms and legs). In connection with this, tall people generally have long limbs and arms^{13,14}. Such body shape and limbs will provide benefits for sports whose specifications require such a body. Somatotype or body shape plays an important role in determining the sport a person chooses to participate in, including volleyball. The supporting factors for success in volleyball and basketball are good playing skills, tactics, techniques, and a suitable body character¹⁵.

Based on the explanation above, the size of the height, the length of the body, the length of the legs, the length of the feet, the lower legs, the upper limbs and the length of the arms are one of the most dominant aspects that determine a person's ability in volleyball. It is related to a person's ability to be able to make a maximum jump. In fact, the anthropometric ratios that are very decisive or related to volleyball and especially the ability to jump are height, body length, leg length, foot length, lower leg, upper leg and arm length. At the beginning of the jump, the weight of the body or upper body is lifted by the upper limbs, followed by the lower legs and

¹² Syarifuddin, A. Per. 20. huan Olahraga. Jakarta : CV. Baru, (1997).

¹³ Carter dan Heath. Somatotyping Development and Application. Cambridge: Cambridge University Press, (1990).

¹⁴ Munivrana, G. Pausic, J. and Kondric, M. "The Influence of Somatotype on Young Table Tennis Players Compete Success". Jurnalof Kinesiologia Slovenica Vol. 17/2011/ No. 1: 42-51, (2011).

¹⁵ Vishaw, G. Singh, M. and Singh, S. "Anthropometric Characteristics, Somatotyping and Body Composition of Volleyball and Basketball Players". Journal of Physical Education and Sports Management Vol. 1/2010/ No. 3: 28-32, (2010).

continued with the soles of the feet which is then ended with the push of the toes. It is undeniable, everything can be maximized if assisted by a swing of the arm up. All these movements must be well coordinated, in order to produce a maximum jump. A well-developed body coordination will result in a good jumping ability as well¹⁶.

This talent scouting manual book for volleyball athletes was developed based on the needs of the community, especially for sports teachers and volleyball coaches in finding prospective volleyball athletes who are very proportional in terms of body size. Until now, there are still many determining that volleyball athletes who come from regions only use student hobbies or also students who can play volleyball, which in the end they (students) will not be able to play at the national or international level.

With this handbook for talent scouting volleyball athletes based on anthropometric ratios, it is hoped that it can help coach concerns in determining prospective volleyball athletes to be fostered.

4 Conclusion

This manual book of talent scouting for volleyball athletes based on anthropometric ratios is very effective and efficient to use in finding for volleyball athletes, and is very helpful for volleyball teachers and coaches in determining prospective athletes who can be trained well so that these athletes can play at the national sports level even international. This book is written in easy-to-understand language with pictures to help teachers and trainers which was done by tests and measurements.

Acknowledgement. We would like to thank all those who have contributed to this research, and the organizers of the publication of this article.

¹⁶ Sugiyanto. *Perkembangan dan Belajar Gerak*. Jakarta: Depdikbud, 1994.

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