

An Analysis of Junior Weight Vest Development to Improve Physical Abilities of Junior Athletes

Made Agus Dharmadi^{1,*}, Ni Ketut Widiartini², I Gusti Lanang Agung Parwata³

¹Department of Sport Coaching Education, Sport and Health Faculty, Universitas Pendidikan Ganesha, Bali, 81116, Indonesia

²Department of Family Welfare Education, Engineering and Vocational Faculty, Universitas Pendidikan Ganesha, Bali, 81116, Indonesia

³Department of Physical Education, Sport and Health Faculty, Universitas Pendidikan Ganesha, Bali, 81116, Indonesia

Received February 23, 2021; Revised March 22, 2021; Accepted April 25, 2021

Cite This Paper in the following Citation Styles

(a): [1] Made Agus Dharmadi, Ni Ketut Widiartini, I Gusti Lanang Agung Parwata, "An Analysis of Junior Weight Vest Development to Improve Physical Abilities of Junior Athletes," *International Journal of Human Movement and Sports Sciences*, Vol. 9, No. 3, pp. 466 - 472, 2021. DOI: 10.13189/saj.2021.090311.

(b): Made Agus Dharmadi, Ni Ketut Widiartini, I Gusti Lanang Agung Parwata (2021). *An Analysis of Junior Weight Vest Development to Improve Physical Abilities of Junior Athletes*. *International Journal of Human Movement and Sports Sciences*, 9(3), 466 - 472. DOI: 10.13189/saj.2021.090311.

Copyright©2021 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract *Background:* Increasing the athlete's physical element is the foundation for improving sports performance. One way to improve physical abilities is through weight training. Junior Weight Vest is one way to exercise weight for junior athletes. This study aims to analyze the development of the Junior Weight Vest to obtain accurate and complete information about the needs, benefits, urgency, form and specifications of the Junior Weight Vest in an effort to improve the physical abilities of junior athletes. *Method:* This research is a descriptive qualitative study with interviews (Focus Group Discussion), questionnaires and literature studies as the data collection methods. The subjects of this study are 20 people consisting of 15 sports coaches and 5 sports training experts. *Results:* The results showed that 1) weight training for junior athletes is needed for physical improvement of athletes, 2) the existence of Junior Weight Vest is not widely known by trainers and sports training experts, 3) the need for Junior Weight Vest is needed, 4) the benefits of Junior Weight Vest are believed to be able to improve junior athlete physical abilities, especially speed, endurance and strength. *Conclusion:* Based on these results, it can be concluded that the development of Junior Weight Vest is greatly needed by coach and sports experts with all the benefits it causes, so that junior athletes can gradually improve their physical abilities in accordance with the rules of sports training.

Keywords Junior Weight Vest, Junior Athletes, Sports

Training

1. Introduction

Sports achievements are strongly influenced by physical abilities [2], whereas physical exercise using weights can be beneficial in strength, power, and muscular endurance [18]. Junior athletes (12-16 years old), who practice weight training, will benefit positively from the weight training [12]. Thus, there will be an increase oxygen intake into the body resulting in performance practice becoming more optimal [16]. Weight training using additional weight in the body is very important for children [4,19]. According to Jan F.Morton[11], weight training for children does not violate the rules and may be done in accordance with the children's condition. It is stated that endurance training in children can improve performance in sports activities [2, 4, 6, 8, 10].

The results of interviews with the trainers showed that weight vests have no known function and benefits, even this vest is not known by the trainers. Whereas since 1978, this weight vest has been patented (weight vest for adults) and the benefits for physical improvement to football players were found by the Texas Tech University through research [17], and in 2001 The American Academy of Pediatrics Issue also states the benefits that weight vests

can increase physical abilities and are safe to wear [6,9]. In the Journal of Human Kinetics in 2016, it is stated that weight vests are very helpful in strengthening bone and isokinetic strength in women [13]. On the other hand, the use of weight vests is believed to be used as a physical training tool in the future to improve athletic performance both for running speed, jump strength and agility [7,18].

The weight vest developed was for junior athletes, because nobody had developed it yet, and there were none in the market as well as the trainers in Bali did not have any, even it was not found in Indonesia. Through a search on Google patents such as the weight vest patent number 794,478 by Dick Tomlinson in 1978, the weight vest patent Number 10/156,434 by George R. Morrison in 1998, the weight vest patent number 29/163,562 by John A. Neider, Madison Gardens, 2002, modular weight vest patent number 15/160,695 by Jo Won Seuk, Fayetteville. In 2016, all of the weight vest patents were intended for adults, no one has patented a weight vest specifically for children and no one has patented a weight vest based on metal waste [14, 15, 20, 22].

Junior athletes are a category of athletes who have participated in various competitions at the local, national and international levels whose ages range from 10-15 years. The Junior Weight Vest that was developed is a very limited tool, especially in Indonesia and no coach has used a weighted vest to train junior athletes, so comparisons are made through theoretical comparisons from various sources in the form of weight vests on the market and in patents google weight vest. This limitation strengthens researchers to immediately conduct research in order to meet the needs of junior athletes in training to improve their physical abilities.

Based on the aforementioned, the problems of this study are 1) What is the benefit of weight training for junior athletes? 2) How is the existence of weight vest in sports? 3) How is the need for weight vest? The research objective is to analyze the development of the Junior Weight Vest to obtain accurate and complete information about the needs, benefits, urgency, form and specifications of the Junior Weight Vest in an effort to improve the physical abilities of junior athletes, based on the results of the *FGD* with sports trainers and experts in the field of sports training in Indonesia-Bali.

2. Materials and Methods

2.1. Patients and Study Design

The design of this study uses quantitative and qualitative descriptive research in which the data obtained are described and processed using descriptive perspective. The sample in this study were 20 people consisting of 15 sports trainers (consisting of 5 martial art sports coaches, 5 game sports coaches, 5 measured sports coaches) and 5

sports training experts who earned a doctorate degree in the Sports Sciences from Sport and Health Faculty in Bali.

2.2. Instruments

Data collection techniques were carried out through interviews through Focus Group Discussions (FGD) and questionnaires. The questionnaire was arranged based on the stages of the preparation from the theories, which include making a grid and a list of questions and testing the validity of the instrument through 2 experts. The theoretical construct is based on the concept of weight vest for junior athletes which is further developed into an instrument lattice consisting of dimensions of weight training for Junior athletes, the existence of weight vest, weight vest requirements and the use of weight training using weight vest for junior athletes, and the content validity. The instrument was tested by 2 experts whose results were validated. The weight vest instrument was also used in FGD activities with trainers and sports training experts, so the results of the completed questionnaire could be deepened with in-depth interviews through the FGD.

2.3. Statistical Analysis

The statistical analysis quantitative used is a simple statistic, by looking for averages, frequencies and percentages in each of the proposed indicators, so that quantitative results are obtained for the need of a junior weight vest in the sports world. And the validity of the qualitative analysis was carried out by data triangulation which included data collection technique triangulation, data source triangulation, time triangulation and theory triangulation.

3. Results

3.1. Participant Characteristics

The research subjects consisted of 15 sports coaches and 5 sports Training experts. The characteristics of these 15 sports coaches are the mastery of the concept of training for athletes. The coaches are 5 coaches in the martial arts, 5 coaches in the sport games and 5 trainers in the measured sports who have more than 5 years of coaching experience. These 15 coaches are believed to have the knowledge and skills so that the data obtained from them for the analysis of the development of the weight vest are very relevant and valid. On the other hand, the characteristics of the 5 experts in the field of sports coaching are experts and experts who earned a doctorate degree in sports science who have the ability to analyze the development of this weight vest, so that the data provided by them can be relevant and valid.

3.2. The Development of Junior Weight Vest

Based on the results of the Focus Group Discussion (FGD) and questionnaires conducted with trainers and sports experts consisting of 15 trainers and 5 experts in the field of sports training on the analysis of the development of weight vest, the following results were obtained:

First, knowledge of weight vests, almost all trainers and sports experts said they never knew and used a device called a weight vest. This is due to the lack of information related to the weight vest, and in terms of its use almost the majority of junior athletes did not use a tool in the form of a weight vest in sports training.

"I really don't know about the tool in the form of a weight vest to improve physical abilities (Parta Lesmana, Karate Coach).

"I personally never knew there was a tool called weight vest, as long as I train for weight training using only existing fitness equipment" (Suratmin, Sports Training Expert).

From the explanation above, it can be concluded that most of the trainers in Buleleng Regency are not aware of the existence of a tool to train their physical abilities namely weight vest.

Secondly, trainers and sports experts mostly know the benefits of a weight vest which include increasing muscle endurance and strength, increasing muscle mass, increasing VO2Max and training physical condition. This is because the weighted vest, which has a load in it, is very easily connoted as a form of weight that can be used for weight training, weight training is beneficial for increasing physical strength. In accordance with what was stated, weight training using additional weight in the body is very important for children [18].

"The benefit of the weight vest for me is to increase the strength of the muscles of the body, with the

appropriate volume and intensity of exercise. It is believed that it can improve physical abilities" (Spyanawati, Pencak Silat Coach).

"From the benefits, this weight vest can physiologically increase the body mass for the people because of the burden on the vest (Hidayat, Sport Training Expert).

From the explanation above, it can be concluded that the benefits of weight vest can significantly increase physical strength, muscle mass, exercise physical condition and improve VO2Max ability.

Third, all coaches and sports training experts also stated that the need for a weight vest in training to improve the physical abilities of junior athletes is really needed. Thus, this development is very suitable and will definitely benefit the world of sports. It is due to the very limited weight training model for junior athletes because the myth should not train using free weights, also the lack of variation in training for junior athletes, so the existence of a weight vest to train muscles becomes very necessary.

"With the benefits arising from the weight vest, then as a coach I really need these tools for my children in the field, the hope is that it will increase the physical abilities of our children" (Laksana, Kempo Coach)

"If indeed this tool (weight vest) will be developed, this tool will specifically be a necessity, because the benefits are good" (Adi, Sports Training Expert)

From the explanation above, it can be concluded that with the development of science and technology, the development of weight vest with all its benefits will be very much needed in the world of sports.

Fourth, most Coaches and sports trainer experts choose the form of weight vest as shown in Table 1:

Table 1. Selection of Models from Coaches and Sports Experts on Junior Weight Vest products

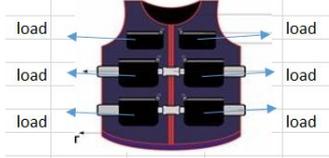
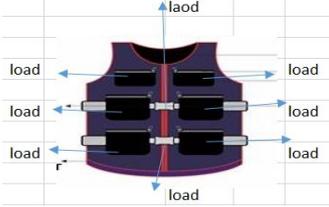
Respondent (n=20)	Plan of Junior Weight Vest Models		
	Model 1	Model 2	Model 3
			
R1			√
R2			√
R3	√		
R4			√
R5			√
R6		√	
R7			√
R8	√		
R9			√
R10			√
R11			√
R12			√
R13			√
R14			√
R15		√	
R16			√
R17			√
R18			√
R19			√
R20	√		
TOTAL	3	2	15
Frequency	15%	10%	75%

Based on Table 1. The selection of the Junior Weight Vest model was 15% of respondents choosing Model 1, 10% choosing Model 2, and 75% choosing Model 3. This shows that the majority of the Junior Weight Vest model chose Model 3.

Fifth, coaches and sports Training experts also choose the weight to be positioned in the front and back parts proportionally and have a cuboids-like shape shown in Table 2.

Based on Table 2. The selection of the weight position in the Junior Weight Vest as much as 85% chose the weight in the vest that is balanced between the left and right vest which consists of three weights on the left, and three weights on the right.

Table 2. Respondent's choices of load position in Junior Weight Vest

Respondent Percentage Choices (n=20)	Respondent's choice of load position in the Junior Weight Vest
85%	
15%	

On the other hand, the results of the FGD which have been concluded by coaches and sports experts as well as experts in the field of fashion design, following results were obtained in Table 3:

Table 3. The Result of Judge Test Material Design of Junior Weight Vest

Item	Material
Outer material	American Drill Fabric
Inner material	Parachute Fabric
Color	Min 2 colors Blue and Red
Aesthetics	Good wear ability and comfortable to use
Zipper	Made of strong plastic
Load	Load form of aluminum cans that are cast and formed into plates with a size of 5cm x 2 cm x 8mm

Furthermore, the Specification of the whole vest is

Table 4. Specification of Junior Weight Vest Result of Focus Group Discussion

Part of Vest	Size
Neck Circumference	40 cm
Body Circumference	80 cm
Waist Circumference	70 cm
Back Length	89 cm
Back Width	42 cm
Chest Width	37 cm
Arm Circumference	41 cm
Shoulder Width	14 cm

Based on the analysis of FGDs and questionnaires and using the product development design according to Dick and Carey, a prototype of the Junior Weight Vest has been produced which has been tested by trainers and sports experts. The results of this prototype may be used by junior athletes in physical training to increase strength, speed, and endurance as shown in Table 5;

Table 5. The Result of Junior Weight Vest Development Are Based on Development Analysis

Type	Product	Explanation
Design		The Junior Weight Vest was developed from cheap fabrics, so that it can be reached by users.
Load		The weight of the vest is made of used cans, which are formed with cast technology, and coated with silica rubber, so that the load surface becomes soft and is not dangerous for the user.

4. Discussion

Based on the results that have been obtained, it can be analyzed and explained as follows:

The knowledge of coaches and sports experts in Bali-Indonesia is very minimal and they have never even used the Junior Weight Vest as a tool to train their athletes. Based on the questionnaire distributed to trainers and sports experts, all of them stated that they did not know about the use of the Junior Weight Vest in the training process. All of the trainers and sports experts have never used the Junior Weight Vest. It shows that the existence of the Junior Weight Vest becomes very important when coaches and sports experts stated that they did not know even though the function of the weight vest as a weight tool is like a vest to improve one's physical condition [21]. Exercises using a weight vest are able to create a good physical condition, if done regularly and with the appropriate volume and intensity [4].

On the other hand, based on further investigation of distributed questionnaires, it is found that coaches and sports experts are very aware of the benefits of using weights in physical training, one of which is the weight vest used as a weight. This is because the knowledge of trainers and sports experts regarding weight training is very good, because they are involved in the context and concept of sports training. The benefits of using loads theoretically and practically can increase physical abilities in the form of strength, speed and endurance [13].

The need for the existence of a Junior Weight Vest by trainers and sports experts is very high, they hope there will be a development of a weight vest for children, because weight training for children is very difficult when using conventional methods, namely using barbells or dumbbells, because it will be dangerous. The development of a special weight vest for children will be able to improve motoric skills, through a gradual increase with weight training that attaches to the body. The motor skills of each child are very different, this is influenced by the level of physical fitness and culture in physical activities [3].

Junior Weight Vest development is carried out through Research and development model according to Dick and Carey [5], through 10 stages, namely 1) assessing needs to identify goals, 2) analyzing the learners and the contexts, 3) conducting model analysis, 4) writing performance objectives, 5) developing assessment model, 6) revising model, 7) developing a strategy model, 8) developing and selecting a material model, 9) developing and constructing evaluation model, 10) designing and conducting summative evaluation. Based on this, the Junior Weight Vest prototype has been developed, and has been tested by sports coaches and sports experts. The results of these trials indicate that the Junior Weight Vest can be used for training for junior athletes. Training using a Junior Weight Vest is believed to be able to improve children's physical abilities so that they can support their appearance in

physical activities. Policies to increase physical activity in children are very diverse, therefore they need to be continuously improved so that the number of children with sedentary activities will not increase [1].

5. Conclusions

Based on the results and discussion, it can be concluded that the development of Weight Vest for junior athletes is very much needed by coaches and sports experts with all the benefits that it brings, so that junior athletes may be able to gradually improve their physical abilities according to the rules of sports coaching and The development of junior weight vest made from Dick and Carey, Research and Development Model produce of cheap product and environmentally friendly materials by utilizing used cans as the load.

Acknowledgments

This research was supported by the following grants from Higher Education Director, Education and Culture Ministry of Indonesia, and was conducted at the Faculty of Sports and Health, Universitas Pendidikan Ganesha, Bali-Indonesia. The data were collected through FGDs and interviews with coaches and experts in the field of sports coaching to obtain data related to the analysis of the development of a junior weight vest for junior athletes. Dean of the Sports and Health Faculty; Coordinator of the Sports Coaching Education Study Program; Chair of the Indonesian National Sports Committee, Buleleng-Bali Regency, who has given permission and information related to the need for conducting research so that this research can run well. Lastly, the students of the Sports Coaching Education program as volunteers and data collection officers in this study.

Authors' Contributions

Researchers and research members consist of various study programs that support the development and completion of this research. Made Agus Dharmadi is a lecturer in the sports coaching education program who contributes in planning, conducting research, analysis and reporting as well as being the leader in FGDs and interviews conducted with coaches and sports coaching experts. Ni Ketut Widiartini is a lecturer in the Family Welfare Education program at the Faculty of Engineering and Vocational Studies, with a specialization of fashion expertise, who contributes to the design and manufacture of weight vests. I Gusti Lanang Agung Parwata is a lecturer in the Health and Recreation Physical Education program who contributes to the analysis of sports training for children so that it supports the basic concepts of exercise for children. Therefore, the suitability of the qualifications

of the research team members is believed to be able to achieve the ultimate goal of this study.

Competing Interests

The authors declare that they have no competing interests.

REFERENCES

- [1] Bompa, Tudor, "Periodization Training for Sport: Theory and Methodology of Training," United State Hunt Publishing Company, 2009, pp. 1-306.
- [2] Rantalainen T, "Effect of Weighted Vest Suit Worn During Daily Activities on Running Speed, Jumping Power, and Agility in Young Men," *The Journal of Strength and Conditioning Research*, vol. 11, no. 26, pp.121-126, 2012. doi: 10.1519/JSC.0b013e318245c4c6.
- [3] Jeff Martin & Cyndi Rodi, "Kids & Weightlifting: Dispelling The Myths," *Issue Twenty Seven Forging the Future of Fitness*, 2008. url: <http://www.crossfit.com/cfseminars/SMERefs/>, (accessed March. 2, 2019).
- [4] Panagiota Klentrou, "Effects of Exercise Training with Weighted Vests on Bone Turnover and Isokinetic Strength in Postmenopausal Women," *Journal of Human Kinetic*, vol. 3, no. 15, pp. 287-299, 2016. doi: 10.1123/japa.15.3.287.
- [5] Dan Baker, "Resistance Training for Children and Youth," *The Australian Strength and Conditioning Association (ASCA)*, Australia, 2007, pp 1-57. url: <https://www.strengthandconditioning.org/>, (accessed March. 2, 2019).
- [6] Rusko H & Bosco C, "Metabolic Response Of Endurance Athletes To Training With Added," *National Strength Coaches Association Journal*, vol. 4, no. 56, pp.412-418, 1987. doi: 10.1007/BF00417768.
- [7] Jan F Morton & Angus K Mc Fadyen, "The effects of progressive resistance training for children with cerebral palsy," *Journal of Clinical Rehabilitation*, vol. 3, no. 19, pp. 283-289, 2005. doi: 10.1191/0269215505cr804oa.
- [8] Faigenbaum, A, "Strength Training for Children and Adolescents," *Journal of Clinics in Sports Medicine*, vol. 4, no. 19, pp. 593-601, 2000. doi: 10.1542/peds.2007-3790.
- [9] Hanna Mellby & Anna-Maria Drake, "Strength Training For Children Aged 6-9 Years - A Survey Among Sports Coaches," *Thesis of Sport Sciences Sport Psychology/Sports Medicine*, Spring, 2011, pp. 1-60. url: <https://lup.lub.lu.se/luur/download?func=downloadFile&recordId=2342688&fileId=2342701> (accessed March. 2,2019).
- [10] Ian Sharman, "Training With Weight Vests. Featured, Training and Racing," <https://ultrarunning.com/featured/training-with-weight-vests/>, (accessed March. 6, 2019).
- [11] Polhemus, Russ, Burkhardt, "The Effects of Plyometric Training Drills on The Physical Strength Gains of Collegiate Football Players," *National Strength Coaches Association Journal*, vol. 2, no. 5, pp. 14-17, 1980. url: <https://journals.lww.com/nsca-scj/toc/1980/10000>.
- [12] Heikki, Rusko & Carmelo, Bosco, "Metabolic Response Of Endurance Athletes To Training With Added Load," *National Strength Coaches Association Journal*, vol. 4, no. 56, pp. 412-418,1987. doi: 10.1007/BF00417768.
- [13] Katherine, S, Dahab and Teri, M, McCambridge, "Strength Training in Children and Adolescents: Raising the Bar for Young Athletes?," *Journal of Sports Health*, vol. 1, no. 3, pp. 223-226, 2009. doi: 10.1177/1941738109334215.
- [14] Faigenbaum, Avery, D, "State of the Art Reviews: Resistance Training for Children and Adolescents:Are There Health Outcomes?," *American Journal of Lifestyle Medicine*, vol. 1, no. 3, pp. 190-200, 2007. doi: 10.1177/1559927606296814.
- [15] Morrison, George, R, "Patent Weight Vest," no. 10/156,434, 1998, www.patent.google.com, (accessed Feb. 21, 2019).
- [16] Neider, John, A, & Gardens M, "Patent Weight Vest" no. 29/163,562, 2002, www.patent.google.com, (accessed Feb. 21, 2019).
- [17] Seuk, Jo, W, Fayetteville, "Patent Modular Weight Vest," no. 15/160,695, 2016, www.patent.google.com, (accessed Feb. 21, 2019).
- [18] Tomlinson, D, "Patent Weight Vest," no. 794,478,1978, www.patent.google.com, (accessed Feb. 21, 2019)
- [19] Stephen, P, Bird, Kyle, M, Tarpenning, Frank, E, Marino, "Designing Resistance Training Programmes to Enhance Muscular Fitness," *Journal Sport Medicine*, vol. 10, no. 35, pp. 841-851, 2005. doi: 10.2165/00007256-200535100-0002.
- [20] Carlos, Luz, Rita, Cordovil, Luis, P, Rodrigues, etc. "Motor Competence and Health-Related Fitness in Children: A Cross-Cultural Comparison Between Portugal and The United States," *Journal Sport and Health Science*, vol. 8, no. 2, pp. 130-136, 2019. doi: 10.1016/j.jshs.2019.01.005.
- [21] Dick, W, Carey, L & Carey, J, O, "The Systematic Design of Instruction," 7th Editions, Pearson Education Ltd., London, 2009, pp.1-344.
- [22] Anna, Chalkley, Karen, Milton, "A Critical Review of National Physical Activity Policies Relating to Children and Young People in England," *Journal Sport and Health Science*, vol. 1, no. 1, pp. 1-8, 2020. doi:10.1016/j.jshs.2020.09.010.