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Adjusment Basketball Facilities and Infrastructure for Children 10-12 Years Old Through Anthropometric Comparison

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Abstrak

Penyelenggaraan pendidikan jasmani diperbolehkan memodifikasi media pembelajaran. Pendidikan jasmani memerlukan sarana dan prasarana yang dirancang khusus untuk mendorong aktivitas jasmani. Tujuan penelitian ini adalah untuk mengembangkan penyesuaian sarana dan prasarana bola basket anak usia 10-12 tahun melalui perbandingan antropometri. Penelitian ini menggunakan penelitian pengembangan sederhana karena masih berupa desain awal. Total sampel penelitian yang terlibat adalah 691 orang. Sampel menjalani pengukuran tinggi badan, rentang lengan, panjang kaki, dan rentang jari. Hasilnya perbandingan rasio sarana dan prasarana dewasa dan anak usia 10-12 tahun sama dengan rasio antropometri sampel penelitian. Penyesuaian sarana dan prasarana olahraga sangat diperlukan untuk tumbuh kembang anak usia 10-12 tahun. Dengan menyediakan ruang di mana anak-anak dapat melakukan aktivitas fisik yang disesuaikan dengan usia dan minat mereka, kami meletakkan dasar bagi gaya hidup sehat, pengembangan keterampilan holistik, pertumbuhan kognitif, dan kesejahteraan emosional.

Kata Kunci: *Fundamental, Bolabasket, Anak-Anak, Antropometri*

Abstract

Implementation of physical education is allowed to modify instructional media. Physical education requires facilities and infrastructure specifically designed to promote physical activity. The aim of this research is to develop adjustments to basketball facilities and infrastructure for children aged 10-12 years through anthropometric comparisons. This research uses simple development research because it is still in the form of an initial design. The total research sample involved was 691 people. The sample underwent height, arm span, leg length, and finger span measurements. The results are that the comparison ratio of facilities and infrastructure for adults and children aged 10-12 years is the same as the anthropometric ratio of the study sample. Sports facilities and infrastructure adjustments are indispensable to the growth and development of children aged 10-12. By providing spaces where children can engage in physical activities tailored to their age and interests, we lay the foundation for healthy lifestyles, holistic skill development, cognitive growth, and emotional well-being.

Keywords: Fundamental, Basketball, Children, Anthropometry

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1. INTRODUCTION

Implementation of physical education is allowed to modify instructional media. Physical education requires facilities and infrastructure specifically designed to promote physical activity; as such, schools must be able to modify their facilities to support physical education programs (Okwang & Mwesigwa, 2022; Viet & Hanh, 2021). Schools must take initiatives to improve their sporting facilities and infrastructure, such as installing new equipment (Viet & Hanh, 2021; Zhang, 2017). Schools should also consider implementing procedures and rules to ensure safety during physical education classes. Schools must create a conducive environment for physical activity (McHugh et al., 2022; Toronjo-Hornillo et al., 2018). A conducive environment includes a flexible curriculum that allows the teacher to design the infrastructure that fits the student's age range. An optimistic approach to physical education and its implementation is vital to creating a supportive environment to encourage children to be physically active, leading to healthy and prosperous lives (Penteado & Neto, 2021; Thanh et al., 2023).

Following Long Term Athlete Development, children aged 10-12 enter the fundamental stage. It is the most crucial stage as it sets the foundation for future learning and success in sports. Children in this stage are in the early development phase and must be taught the essential skills to participate in any sport properly (Adel Gabal, 2018; Arifin et al., 2020; Šimůnková et al., 2010). This stage is all about skill acquisition and skill development. The fundamental stage involves two parts: motor skill development and sports skill development. In motor skill development, children learn how to move their bodies differently by participating in running, jumping, hopping, and throwing activities (Field & Temple, 2017; Kokštejn et al., 2017; Saputra et al., 2021). These activities develop the fundamental movement skills needed for sports. In sports skill development, children learn specific skills and rules by participating in organized sports activities. Teacher and Parents should not push their children too hard or force them to perform movements they are not physically capable of. They should also be mindful of preventing injuries by using proper equipment and teaching techniques.

Basketball can be used as a fun way to practice basic moves. Among various sports, basketball is unique due to its fast-paced nature and the countless opportunities for children to develop and hone their skills. Basketball is a game and an excellent avenue for practicing basic moves enjoyably and encouragingly (Kozina et al., 2017; Lewis et al., 2020). A game emphasizing teamwork and individual prowess makes basketball an appealing way to practice basic moves, as participants are more likely to stay motivated and committed to practice. Encouragingly, basketball also fosters teamwork and socialization as children learn to communicate and cooperate effectively with their peers (Miller, 2013; Supola et al., 2023; Wen, 2019). The game nurtures a sense of camaraderie and sportsmanship, creating a positive atmosphere wherein children can thrive and explore their abilities. The team bond further fuels enthusiasm and a desire to excel, leading to an increased commitment to practicing basic moves and elevating their overall game (Boyle & Magnusson, 2007; Watkins, 2014).

Modifications according to children's anthropometry are highly recommended considering that their physical abilities are still different from adults. Anthropometry measures human body size and proportions. Children's anthropometric dimensions are inherently different from those of adults due to their ongoing growth and development (Dianat et al., 2018; Tur & Bibiloni, 2019). It is crucial to recognize that children possess distinct physical abilities that are still evolving and therefore require tailored modifications to adapt to their needs. Age-appropriate equipment, appropriately sized and designed for their unique physical abilities, mitigates the risk of injuries (Faigenbaum & Myer, 2010; Kennedy & Yun, 2019). Age-appropriate sports equipment helps children develop motor skills, allowing them to participate actively and enjoyably in physical activities. Modifying design elements to match children's anthropometry instills a sense of independence and confidence (Fredriksen et al., 2018; Pramesthi et al., 2022; Purcell, 2014). Incorporating modifications according to children's anthropometry is essential for catering to their unique physical abilities. Modifications enhance accessibility, safety, and motor skill development and encourage independence, ultimately fostering a positive outlook toward their physical capabilities. The aims of this study is to develop adjustments to basketball facilities and infrastructure for children aged 10-12 years through anthropometric comparisons.

2. METHODS

This research uses simple development research because it is still in the form of an initial design. Anthropometric comparisons between adults and children aged 10-12 years are used to determine the size of basketball facilities and infrastructure. Standard facilities and infrastructure for playing conventional basketball cannot be used by children aged 10-12 years. Anthropometric differences cause these limitations. Anthropometric comparisons were made by comparing height, leg length, arm span, and finger span between adults and children aged 10-12. The comparison ratio is used to determine the size of facilities and infrastructure. The results are that the comparison ratio of facilities and infrastructure for adults and children aged 10-12 years is the same as the anthropometric ratio of the study sample. The total research sample involved was 691 people. The distribution is show in Table 1.

Table 1. Distribution of Research Samples based on Age and Gender

Category/Age	Number Based on Sex		Total
	Male	Female	
Adult/19-20	107	71	178
Child/12	104	69	173
Child/11	103	68	171
Child/10	103	66	169

The sample underwent measurements of height, arm span, leg length, and finger span. Body height was measured using a stature meter, and the sample stood barefoot with the whole body against the wall. Arm span is measured from the middle finger of the right hand to the left hand in a position where the hands are wide open, and the body is against the wall. Leg length is measured by measuring the leg from the groin to the sole. Finger span is measured by measuring the distance between the tip of the thumb and the tip of the little finger. The palms and fingers are broad apart when the measurement is taken.

3. RESULTS AND DISCUSSION

Result

All measurement results are taken on average to simplify the comparison process. Regarding height, arm span, and leg length, the average taking did not differentiate between sex. The basketball court and hoop are the same size for men and women. The average value taken based on gender is only the aspect of finger span because the size of the ball used by men and women is different. The average results of anthropometric measurements can be seen in Table 2.

Table 2. The Average Results of Anthropometric Measurements

Category/Age	Adult/19-20	Child/12	Child/11	Child/10
Height (cm)	165.7	138.65	132.95	127.6
Arm Span (cm)	155.76	130.33	124.97	119.94
Leg Length (cm)	86.164	72.098	69.134	66.352
Male Finger Span (cm)	19.3238	16.1693	15.5045	14.8806
Female Finger Span (cm)	18.6239	15.5836	14.943	14.3417

Base on Table 2 determining the size of facilities and infrastructure depends on the characteristics of these facilities and infrastructure. Facilities and infrastructure that use height are adjusted according to the height ratio. Facilities and infrastructure with a horizontal dimension then use the leg length ratio. Everything related to shooting distance uses a comparison of arm spans as an adjustment. The size of the ball is adjusted using a comparison of finger spans. The size is based on which aspect is dominant concerning the size of facilities and infrastructure. FIBA (Federation of International Basketball Association) determines the size of basketball facilities and infrastructure. FIBA is the highest body in the world that regulates basketball development. Many sizes need to be adjusted so children aged 10-12 can play safely and according to their growth and development—adjustments to court dimensions, hoop height, and ball size. The dimensions of the size of the backstop (the term used to refer to a basketball set, rebound board, and supporting equipment) are only adjusted for height. The backboard and basketball sizes still use standard sizes to make the game more accessible and fun. Details of adjustments to the size of facilities and infrastructure can be seen in Table 3.

Table 3. Basketball Facilities Adjustment

Aspects	Standard Size	Size for 12 Years	Size for 11 Years	Size for 10 Years	Unit	The Ratio used
Ring height	3.05	2.55	2.45	2.35	m	Height
Restricted area length	5.80	4.85	4.65	4.47	m	Arm span
Restricted Area Width	4.90	4.10	3.93	3.77	m	Arm span
The distance between 3 points line with the sideline	0.90	0.75	0.72	0.69	m	Arm span
The distance between 3 points line with the endline	8.33	6.97	6.68	6.41	m	Arm span
Radius semicircle restricted area	1.80	1.51	1.44	1.39	m	Arm span
Field length	28.00	23.43	22.47	21.56	m	Leg length
Field width	15.00	12.55	12.04	11.55	m	Leg length
Diameter of the center circle	3.60	3.01	2.89	2.77	m	Leg length
Rebound* Place	0.85	0.71	0.68	0.65	m	Leg length
The distance between the first rebound* and the end line	1.75	1.46	1.40	1.35	m	Leg length
The size of the neutral zone at the rebound* site	0.40	0.33	0.32	0.31	m	Leg length
Ball diameter (Male)	74.90-78.00	62.67-65.27	60.10-62.58	57.68-60.07	cm	Finger span
Ball weight (Male)	567.00-650.00	474.44-543.89	454.93-521.53	436.63-500.54	gram	Finger span
Ball diameter (Female)	71.50-73.00	59.83-61.08	57.37-58.57	55.06-56.21	cm	Finger span
Ball weight (Female)	510.00-550.00	426.74-460.21	409.20-441.29	392.73-423.54	gram	Finger span

Discussions

The basketball game aims to shoot a ball into a basket mounted at a height of 3.05 meters. Basketball players must jump and reach a certain height to make successful shots. In that case, height will help the player score more efficiently. Taller players typically have longer arms and legs, which gives them greater reach and allows them to block more shots and grab more rebounds (Cabarkapa et al., 2022; Muhammad, 2021). Those players also have a higher shooting release point, making it more difficult for defenders to contest their shots (García-Rubio et al., 2020; Talab & Abd Alsatar, 2020). However, height alone does not make a great player. Developing skills such as ball-handling, passing, shooting, and defensive strategies is essential to become an all-around player (Epure & Bădău, 2021; França et al., 2021). One of the biggest challenges youth players face when making shots is the height of the basket itself. A standard basketball hoop can seem daunting for young players who are still growing and may not have the necessary strength to get the ball to the rim. Coaches and parents need to understand the physical limitations of youth players (Nasrulloh et al., 2021; Peña-González et al., 2021). Using smaller, more age-appropriate hoops or even lowering the rim for younger players can help build the fundamental skills needed for shooting.

The arm span's length can affect a player's ability to shoot, pass, rebound, block, and defend. A player's arm span can be a considerable asset in shooting, especially in long-range shooting and creating space (França et al., 2022; Li et al., 2017). Long-range shooting refers to shots taken beyond the three-point line, eighteen feet and nine inches from the basket. Players with long arms have a better chance to shoot from long range as they can stay extended for longer, creating a higher release point (Matulaitis et al., 2019; Ortega-Toro et al., 2021). Arm span plays a vital role in rebounding. Rebounding is one of the most critical aspects of basketball, and it is often determined by the player who can get the basketball to its highest point (Lorenzo et al., 2019; Wierike et al., 2018). Players with long arms have an advantage when grabbing rebounds because they can extend their arms higher than players with shorter arms.

Leg length is an essential factor in basketball game performance. In basketball, a game that requires agility, speed, and verticality, leg length emerges as a crucial element in determining an individual's capabilities on the court. Leg length undoubtedly offers distinct biomechanical advantages for basketball players. Longer legs provide a greater stride length, allowing players to cover more ground in less time (Kryeziu, 2019; Štrumbelj & Erčulj, 2014). The efficient navigation basketball court is crucial for offensive and defensive purposes. Longer legs give players a more excellent range of motion, allowing them to cover larger areas quickly and effectively (Borges Gomes et al., 2023; Domínguez-Díez et al., 2021). The increased maneuverability of longer legs amplifies a player's overall performance, making them more versatile and adaptable on the court.

Within basketball technique, finger span and palm functionality play pivotal roles in enhancing players' performance and overall gameplay. Finger span impacts shooting accuracy, ball handling, and defensive capabilities, highlighting the essential role of palm dexterity in these aspects of the game (Jamkrajang et al., 2022; Salafi et al., 2022). A player's finger span and hand coordination dramatically influence the ability to hit shots consistently. A wider finger span allows for a better grip on the basketball, providing enhanced control and leverage during the shooting motion (Apostolidis & Emmanouil, 2015; Blantas et al., 2022). An optimal finger span can also contribute to improved shooting touch. Basketball involves many ball-handling skills, including dribbling, passing, and catching. These skills significantly demand a player's finger span and palm functionality. Furthermore, passing accuracy and velocity are greatly affected by finger span (Joksimovic et al., 2018; Vencúrik et al., 2021). The wider the span, the greater the surface area available for contact with the ball, leading to improved control and precision during passes.

The implications of this research may lead to recommendations for updating or adapting sports facilities to better suit their needs. The results of this research can be used by organizations or schools to develop sports programs that are more appropriate to the physical development of children in the 10-12 year age range. This can help enhance their sporting experience and encourage more active participation. This study may have limitations in terms of generalizability. The results found may apply only to the age group of children 10-12 years and cannot be applied to other age groups or to more experienced basketball players.

4. CONCLUSION

Beyond physical fitness, sports facilities and infrastructure adjustments provide ample opportunities for children to develop a wide range of skills. Sports facilities and infrastructure adjustments are indispensable to the growth and development of children aged 10-12. By providing spaces where children can engage in physical activities tailored to their age and interests, we lay the foundation for healthy lifestyles, holistic skill development, cognitive growth, and emotional well-being. The cumulative impact of these factors goes far beyond the confines of the sports facility, shaping children into well-rounded individuals who possess valuable life skills and a positive mindset. As we invest in these improvements, let us remain steadfast in our optimism, recognizing the transformative power of sports facilities and infrastructure adjustments in building a bright and active future for our children.

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