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GRADUATE STUDIES DIRECTORATE

**THE RELATIONSHIPS BETWEEN AGILITY AND JUMPING ABILITY
OF FEMALE VOLLEYBALL CLUBS IN WOLAITA SODO UNIVERSITY**

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ASEGEDECH BASSA

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**The Relationships between Agility and Jumping Ability of Female Volleyball
Clubs in Wolaita Sodo University**

By:

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**A Thesis Submitted to Wolaita Sodo University College of Natural and
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University**

**In Partial Fulfillment of the Requirements for the Degree of Master of
Education in Volleyball Coaching**

Major Advisor: Afework Asale (Assistant Professor)

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Wolaita Sodo, Ethiopia

APPROVAL SHEET

As this research advisor, we here by certify that we have read and evaluated this thesis prepared under our guidance by **Asegedech Bassa** Entitled “the Relationships between agility and jumping ability in Female Volleyball clubs in Wolaita Sodo University. We recommend that it be submitted as fulfilling the thesis requirement.

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External examiner	Signature	Date

DEDICATION

This thesis is dedicated to my beloved mother and father, and also my husband Dr. Ashebir Mathewos (MD) for her unconditional love and support throughout all my way to reach my destination. Furthermore, I could not have done this without the support of the volleyball players in Wolaita Sodo University female volleyball club and coaches.

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholar matter that in included in the thesis has been given recognition through citation. Every serious effort has been made to avoid any plagiarism in the preparation of this thesis.

This thesis is submitted in partial fulfillment of the requirement for a degree from the graduate studies directorate of Wolaita Sodo University. The thesis is deposited in the university library and is made available to borrowers under the rules of the library. I solemnly declare that this thesis has not been submitted to any institution anywhere for the award of any academic degree, diploma or certificate.

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AUTOBIOGRAPHY

The author Asegedech Bassa was born in 1 March 1989 in Sodo town, Wolaita, SNNPR. When her age reached to school she attended in (1995-2001) 1-6 grades in Aba Pascal primary school, (2002-2003) 7-8 in Georgis primary school and (2004-2005) 9-10 in Bogale Walelu general secondary school. She then joined Awassa college of Teachers Education in 2006 and educated sport science for two years. Later she joined Adama science and Technology University in 2012 and graduated with B.Sc. in Sport Science from Adama science and Technology University in 2016. After graduation she was assigned to Tebela Secondary school, Wolaita zone and serving there recently. In 2022 she joined Wolaita Sodo University School of graduate studies to pursue her postgraduate study in Volleyball coaching.

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LIST OF ABBREVIATIONS

CMJ_____ Counter Movement Jump

COD_____ Change of Direction

SD_____ Standard Deviation

SJ_____ Squat Jump

SNNPR_____ South Nations, Nationalities and Peoples Region

SPSS_____ Statistical Packages for Social Science

VJ_____ Vertical Jump

WSU_____ Wolaita Sodo University

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ABSTRACT

The study aimed to investigate the relationship between agility and jumping ability among female volleyball clubs at Wolaita Sodo University. Data were collected from 18 volleyball team players using cross-sectional and experimental research designs. The primary data source was 12 female volleyball clubs, selected through purposive sampling. The study employed T-tests for agility and electronic devices for measuring vertical jump height. Data were recorded on individual sheet cards, transferred to roll sheets, and evaluated. A standardized warm-up protocol, including a 24-hour restriction on physical activity, ensured uniform preparation for all participants. For the 12 volleyball players, the mean (SD) age was 20.33 ± 1.97 years, height was 1.73 ± 0.39 m, and weight was 61.26 ± 3.78 kg. Both the T-test for agility and the vertical jump test were used to assess performance. A significant negative correlation was observed between vertical jump and agility ($P < 0.01$), with vertical jump and agility demonstrating a strong inverse relationship ($r = -0.799$ and -0.777 , respectively). In conclusion, this research shows that vertical jump performance positively impacts agility in female volleyball players. The relationship between jump performance and agility is essential for generating high force, executing rapid stretch-shortening cycle movements, and achieving whole-body movements at high speed. Effective vertical jump training for volleyball teams can be implemented efficiently, but future research should explore this relationship further in longitudinal studies. Additionally, vertical jump and agility development programs can be designed cost-effectively, making them accessible for a wide range of training environments. This study's results suggest that coaches can utilize agility-focused training to enhance vertical jump development in volleyball athletes.

Keywords: Volleyball, Vertical jump, agility, sport

1. INTRODUCTION

1.1 Background to the Study

Volleyball, as a sports game, requires from the players a high level of preparedness with respect to all the motor abilities as well as an efficient execution of necessary technical and tactical game elements (González-Rave, Arija, Clemente-Suarez, 2011). Correspondingly, volleyball as a physical activity positively affects the development of motor abilities such as explosive strength, repetitive strength, speed, and movement coordination (Dyba 1982). As a result, the success of volleyball play largely depends on movement speed without a ball, speed of rhythm and movement change, agility, and jumping ability (Kunstlinger, Ludwig, and Stegmann, 1978).

In volleyball, performance depends on well-developed physical quantities, such as agility and vertical jumping, and superior anticipation and decision-making skills. Volleyball performed on an area requires high-speed whole-body movements. Many of these are in response to the motion of a ball, opposing players, or teammates. Thus, volleyball is an intermittent sport that combines active and passive phases of play and requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity (Borras, Balius, Drobanic, & Galilea, 2001; Gabett and Georgeiff, 2007). The sport of volleyball incorporates highly specific movement patterns while emphasizing different metabolic systems. Volleyball uses three main positions: front row hitters, front and back row hitters, and back row defense (Dyba, 1982). Each position employs unique footwork patterns, muscle recruitment, metabolic systems, and upper and lower extremity positions (Sheppard, Gabett, Claudio, & Newton, 2010).

Furthermore, volleyball is an intermittent sport in which the vertical jump is a fundamental part of the spike, the block, the topspin, and floating serves. The most effective spike in volleyball is likely dependent on vertical jump height and the body position adopted before ball contact. Specifically, a high vertical jump in volleyball is a critical component in hitting and blocking.

Indeed, the vertical jump is a common tool used to assess explosive strength in volleyball athletes (Fry, Kraemer, Weseman, Conroy, Gordon, Hoffman, & Maresch, 1991). During volleyball competitions, players are involved in defensive and offensive jumping activities where power, strength, agility, and speed are required (González-Ravé, Arija, and Clemente-Suarez,

2011). In order to reach the maximal height quickly, large amounts of vertical force must be produced as quickly as possible. Barnes et al. (2007) found that optimal production of maximal lower body power was obtained by converting substantial amounts of horizontal force into vertical force. Repeated force productions as well as repeated maximal jump height are important in volleyball performance (Hedrick, 2007).

Moreover, athletic performance coaches are responsible for the improvement of these movements. Speed, agility, and power are important components of sports performance (Bompa, 1999). Agility performance has been determined in many ways, including “the whole body’s quick or accurate movement in response to a stimulus” (Chelladurai, 1976) and “the ability to change direction as well as to start and stop quickly” (Ellis, Gatin, Lawrence, Savage, Sheales, Stapff, Tumilty, & Quinn, 2000; Little & Williams, 2005; Young, Bknton, Duthie, & Pryor, 2006). Also, agility has been reported to be influenced by explosive strength, balance, muscular coordination, and flexibility (Young & Farrow, 1979). Agility deals with changes in direction and the ability to effectively couple eccentric and concentric actions in ballistic movements. The cognitive components involved in tasks that have traditionally been described as agility [e.g., athletic sprint start, shot put, zig-zag runs] differ greatly from tasks that contain significant uncertainty of time or space (e.g., reacting to a spike in volleyball, evading an opponent in football).

1.2. Statement of the problem

In volleyball performance depends on well-developed physical qualities, which are agility, acceleration, strength, and vertical jumping, and superior anticipation and decision-making skills. Volleyball performed on an area requires high-speed whole body movements. Many of these are in response to the motion of a ball, opposition players, or team-mates. Thus, volleyball is an intermittent sport that combines active and passive phases of play and requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity (Borras X, et al., 2001).

Also, volleyball is an intermittent sport that vertical jump is a fundamental part of the spike, the block, and the topspin and floating serves. The most effective spike in volleyball is likely dependent on vertical jump height and the body position adopted before ball contact.

Specifically, a high vertical jump in volleyball is a critical component in hitting and blocking. Indeed, the vertical jump is a common tool used to assess explosive strength in volleyball athletes. During volleyball competitive, players are involved in defensive and offensive jumping activities where power, strength, agility, and speed are required. Generally, athletic performance coaches are responsible for the improvement of these movements. Speed, agility, and power are important components of sport performance. Agility performance has been determine many ways, including “the whole body quick/accurate movement in response to a stimulus” and “the ability to change direction, as well as to start and stop quickly” (Ellis L et al., 2000).

Few studies have shown strong relationships between strength and power measures and vertical jump performance (Ashley & Weiss, 1994; Peterson, Alvar, & Rhea, 2006), suggesting that to some extent, strength and power qualities influence performance in vertical jumping.

Previous studies have provided evidence to support the idea that volleyball is practiced by children, younger people, adults, and elders of both sexes across the globe and has a team at the school, college, university, and club level (Amasay, 2008). Prior research articles reported that neither Ethiopian clubs nor the Ethiopian national team have recorded remarkable results at a continental and global level (Temesgen, 2012).

Numerous studies have revealed that agility and jumping ability are needed by volleyball players (Hedrick, 2007). Similarly, Gabbett & Georgiff (2007) and Molenaar (2009) suggested that without the endowment of agility and jumping ability, it is found to be the most difficult to perform better and overwhelm the opponent. A few studies agreed that the agility and jumping ability of volleyball relationships have never been addressed (Gutierrez & Marcoos, 2009). Some research output shows that insufficient evidence has been reported in the Ethiopian context in regard to the agility and jumping ability of volleyball players’ performances. Hence, the researcher aimed to explore the relationship between agility and jumping ability of Female Volleyball clubs of the Wolaita Sodo University.

1.3 Objectives of the study

1.3.1. General Objective

The general objective of this study is to investigate the relationships between agility and jumping ability of Female Volleyball clubs of Wolaita Sodo University.

1.3.2. Specific Objectives

- To assess the agility levels of female volleyball players through standardized agility tests, such as the T-test or Illinois agility test, to establish a baseline for comparison.
- To evaluate Jumping Ability: Analyze the jumping ability of female volleyball players using vertical jump tests, such as the Sargent jump or squat jump, to determine the current performance levels of the athletes.
- To investigate the effect of agility on jumping ability of Female Volleyball clubs of Wolaita Sodo University female volleyball club.

1.4 Research Hypothesis

The following hypotheses were addressed in the study;

H01: There is a significant difference in agility levels among female volleyball players, as measured by standardized agility tests such as the T-test and Illinois agility test.

H02: There is a significant difference in jumping ability among female volleyball players, as measured by vertical jump tests such as the Sargent jump and squat jump.

H03: Agility has significant role on jumping ability of Female Volleyball clubs of Wolaita Sodo University female volleyball club.

1.5 Significance of the study

This study is the first of its kind that was conducted on the relationships between agility and jumping ability of Female Volleyball clubs of Wolaita Sodo University female volleyball club.

Therefore, the researcher hopes that the findings of the study:

- Can be used as a baseline or preliminary information source for organizations or persons who are interested to investigate the relationships between agility and jumping ability of Female Volleyball clubs at Wolaita Sodo University.
- Give relevant information about the relationships between agility and jumping ability of Female Volleyball clubs at Wolaita Sodo University.
- It serves as a source for other researchers to conduct further and detailed study on similar topics.

1.6 Scope of the Study

This study was delimited to investigate the relationships between agility and jumping ability of Female Volleyball clubs in Wolaita Sodo University female volleyball club.

1.7. Limitations of the study

Because of financial and resource limitations the study was conducted on Wolaita Sodo University female volley ball club. The availability of reliable data for any research was an important input for success and achievement of the final outcome of the research work. Under this consideration the above reason, time, money, accessibility of secondary documents and getting the appropriate information from respondent was the major limitation for the researcher.

1.8. Operational Definition of Terms

Volleyball: game played by two teams, usually of six players on a side, in which the players use their hands to bat a ball back and forth over a high net, trying to make the ball touch the court within the opponents' playing area before it can be returned.

Agility: as often presented by the terms memory ability, mobility etc., it is the ability to change the directions of the body and its parts rapidly. Agility is the capacity of the individual to measure by the rate of change his position in pace.

Vertical jump: is a common tool used to assess explosive strength in volleyball athletes (Fry, Kraemer, Weseman, Conroy, Gordon, Hoffman, & Maresh, 1991). During volleyball competitions, players are involved in defensive and offensive jumping activities where power, strength, agility, and speed are required (González-Ravé, Arija, and Clemente-Suarez, 2011).

1.9. Organization of the study

The study was organized in to five chapters. Chapter one was covers background, statement of the problem, objective, research question, significance, scope and limitation of the study. Chapter two was holds review findings of other theoretical studies. Chapter three was presents background characteristics of the study area and methodology of the theses. Chapter four was deals results and discussions. Chapter five concludes with a recommendation and conclusion. The paper's appendices and reference portion were written in the end.

2. REVIEW OF RELATED LITERATURE

2.1 Volleyball History

Volleyball was invented in 1895 by William G. Morgan, the physical director of the Young Men's Christian Association (YMCA) in Holyoke, Massachusetts. Morgan created the sport as an indoor activity for businessmen who found the new game of basketball too vigorous. Initially, he called the sport "mintonette," but a professor from Springfield College in Massachusetts observed the volleying nature of the game and suggested the name "volleyball," which better reflected its gameplay (Baker, 2018).

The original rules of volleyball were drafted by Morgan and published in the first edition of the Official Handbook of the Athletic League of the Young Men's Christian Associations of North America in 1897. The game quickly gained popularity in the United States, appealing to both men and women in schools, playgrounds, the armed forces, and various organizations. By the early 1900s, volleyball was introduced to other countries, leading to its growth as a global sport (Hanson, 2019).

Volleyball is played by two teams, usually consisting of six players on each side. The objective of the game is to use hands to bat a ball back and forth over a high net, attempting to make the ball land on the opponent's court while preventing it from touching the ground on their side. A player on the opposing team can use their hands to send the ball up to a teammate before it touches the ground; this teammate can then volley the ball back over the net or pass it to another teammate for an attempt to score. Each team is allowed a maximum of three touches of the ball before returning it over the net (Bowers, 2020).

2.2. Agility

Agility is defined as the ability to change the position of the body in pace rapidly and accurately without loss of balance. It is recognized as a fundamental component of motor performance and plays a critical role in various sports and physical activities. While agility is often associated with quickness and responsiveness, its exact nature encompasses several dimensions, making it a complex and multifaceted skill (Balsalobre-Fernández, C., et al., 2016).

2.2.1 Components of Agility

- **Speed:** Agility involves rapid movements and quick changes in speed. Athletes must not only be fast but also able to accelerate and decelerate effectively. Speed is a vital aspect of agility, as it determines how quickly an athlete can react to stimuli and make directional changes.
- **Balance:** Maintaining stability during movement is crucial for agility. Athletes must have strong balance to control their body when executing sudden changes in direction. This requires the ability to coordinate movements effectively while keeping the center of gravity stable.
- **Coordination:** Agility also relies on coordination, which refers to the harmonious integration of different body parts during movement. Effective coordination allows athletes to execute complex maneuvers with precision, enhancing their overall agility.
- **Reaction Time:** Quick response to external stimuli is essential for agility. Athletes need to process information rapidly and make decisions on how to move in response to their environment, whether that be an opponent's actions in a game or obstacles in their path.
- **Flexibility:** A certain level of flexibility is necessary for agile movements. Athletes must be able to stretch their muscles and joints to achieve the full range of motion required for effective directional changes.

2.2.2 Measurement of Agility

Agility can be measured through various tests and assessments designed to evaluate an individual's ability to change direction and speed. Common agility tests include:

- **T-Test:** This test involves running in a T-shaped pattern, requiring participants to sprint, shuffle sideways, and backpedal. It measures overall agility and ability to change direction.
- **Illinois Agility Test:** This test consists of a set course where participants sprint, shuffle, and run backward. It provides a standardized measure of agility.
- **Pro-Agility Shuttle (5-10-5):** This test involves sprinting 5 yards to one side, changing direction to sprint 10 yards to the opposite side, and then returning 5 yards to the starting point. It assesses quick changes in direction.

2.2.3 Importance of Agility in Sports

Agility is crucial in many sports, where the ability to maneuver quickly and effectively can significantly influence performance. For instance:

- In basketball, players need agility to dodge defenders and change direction rapidly while dribbling or shooting.
- In soccer, agility allows players to evade tackles, position themselves optimally, and execute quick movements to maintain possession of the ball.
- In tennis, agility is essential for reaching and returning shots quickly, enabling players to respond to their opponent's plays effectively (Young, W. B., & Hughes, M. (2018))

2.3 Sport training:

Sport training is a multifaceted process that involves the systematic application of specific stimuli to facilitate complex biological, psychological, and social adaptations in athletes. This comprehensive approach aims not only to enhance physical performance but also to develop various attributes essential for success in competitive sports.

At its core, sport training is about **systematic loading**, which refers to the structured and progressive application of training stimuli. These stimuli can take various forms, including physical exercises, drills, mental conditioning, and tactical strategies. The key objective of this loading is to induce adaptations that improve the athlete's overall performance. This process is often tailored to the individual needs of the athlete, taking into consideration factors such as age, experience level, and specific goals (Šimonek, 2014).

2.3.1 Biological Adaptations

Biological adaptations primarily involve physiological changes in the body that enhance performance. These include:

1. **Muscular Adaptations:** Training leads to increased muscle strength, endurance, and hypertrophy. For instance, resistance training can significantly improve muscle power and size, enabling athletes to perform better in their respective sports (Kraemer & Ratamess, 2004).

2. **Cardiovascular Improvements:** Endurance training enhances the efficiency of the cardiovascular system, increasing the heart's stroke volume and the body's ability to deliver oxygen to working muscles. This is crucial for athletes participating in endurance sports (Tanaka & Swensen, 1998).
3. **Neurological Adaptations:** Training also affects the nervous system, improving coordination, reaction time, and overall motor skills. Enhanced neural pathways result in more efficient movement patterns and quicker responses during competition (Maffiuletti et al., 2016).

2.3.2 Psychological Adaptations

Psychological factors play a crucial role in an athlete's performance. Sport training can help in developing:

1. **Mental Toughness:** Regular training challenges athletes, fostering resilience and the ability to perform under pressure (Gucciardi et al., 2015).
2. **Focus and Concentration:** Training routines often incorporate mental exercises that improve focus and the ability to concentrate, which are essential during competitions (Morris et al., 2017).
3. **Confidence and Motivation:** Setting and achieving training goals can significantly enhance an athlete's confidence and motivation, leading to better performance outcomes.

2.3.3 Social Adaptations

Sport training also has a social dimension, contributing to the development of teamwork and communication skills. The interaction with coaches and teammates fosters:

1. **Team Cohesion:** Engaging in team training sessions promotes trust and collaboration, essential for team sports. Cohesion among team members can lead to improved performance on the field (Carron et al., 2002).
2. **Social Skills:** Athletes learn to communicate effectively, resolve conflicts, and work collaboratively towards common goals, which are valuable skills both in sports and in life.

2.3.4 Skill Development

In addition to physical and psychological adaptations, sport training emphasizes the acquisition of knowledge and motor skills. This includes:

1. **Motor Skills Acquisition:** Athletes develop technical skills necessary for their sport through repetitive practice and feedback, leading to greater proficiency in their movements (Magill, 2011).
2. **Tactical Knowledge:** Training also focuses on teaching athletes about game strategies, positioning, and decision-making, enabling them to perform effectively during competitions.
3. **Behavioral Adaptations:** Athletes learn to exhibit behaviors aligned with successful performance, including discipline, sportsmanship, and strategic thinking (Côté & Gilbert, 2009).

2.4. Factors influencing agility performance

Several factors have been reported as possibly influencing agility performance (Young et al., 2002; Sheppard & Young, 2006a). Cognitive and perceptual factors are considered the discriminating factor in agility performance; however, the majority of research has focused on the physical aspect (Paul, Gabbett, & Nassis, 2016). Cognitive and perceptual factors distinguish between high- and lowlevel agility performances (Scanlan, Humphries, Tucker, & Dalbo, 2014). Physical factors constitute the greatest proportion of total time to complete an agility test. They include strength and power qualities, and functional movement. Agility performance is influenced by a variety of factors, which can be broadly categorized into cognitive, perceptual, and physical components. Understanding these factors is crucial for developing effective training programs aimed at enhancing agility in athletes.

2.4.1 Cognitive and Perceptual Factors

Cognitive and perceptual factors are increasingly recognized as critical components that can distinguish high-level agility performance from lower-level performance. These factors encompass an athlete's ability to process information quickly, anticipate movements, and make rapid decisions. Key aspects include:

1. **Anticipation and Decision-Making:** Athletes who can quickly anticipate opponents' actions or the trajectory of the ball often demonstrate superior agility. This involves recognizing patterns in gameplay and making split-second decisions about how to respond (Young et al., 2002).
2. **Visual Perception:** Effective visual scanning and depth perception are essential for agility. Athletes must be able to accurately assess their surroundings, including the position of teammates, opponents, and obstacles, which can greatly influence their ability to maneuver effectively (Sheppard & Young, 2006a).
3. **Cognitive Processing Speed:** The speed at which an athlete can process information and react to stimuli is crucial. Faster cognitive processing allows for quicker reactions, facilitating more agile movements (Scanlan et al., 2014).

While cognitive and perceptual factors play a significant role in agility performance, much of the existing research has focused on the physical aspects of agility training, which can sometimes overshadow these critical mental components (Paul, Gabbett, & Nassis, 2016).

2.4.3 Physical Factors

Physical factors are paramount in determining agility performance, as they comprise the physiological capabilities necessary to execute quick movements and directional changes. Key physical factors include:

1. **Strength and Power:** An athlete's ability to exert force rapidly is fundamental to agility. Strength training enhances muscle power, enabling quicker and more explosive movements, which are essential during agility tests (Lockie & Bailey, 2017).
2. **Speed and Acceleration:** The ability to accelerate quickly is vital for effective agility performance. Athletes with higher sprinting speeds can initiate changes in direction more efficiently, leading to improved agility (Bishop & Edge, 2015).
3. **Functional Movement:** Good functional movement patterns contribute to overall agility. Athletes who exhibit optimal movement mechanics can change directions more effectively and with greater control, reducing the risk of injury (Pojskic & Kocic, 2018).

4. **Flexibility:** Flexibility affects the range of motion in joints, which is crucial for executing swift changes in direction. Improved flexibility can enhance movement efficiency and reduce the risk of muscle strain (Mason et al., 2018).
5. **Balance:** Effective balance is essential for maintaining stability during rapid movements. Training that focuses on improving balance can directly impact an athlete's ability to perform agile movements (Wang et al., 2015).

2.5 Anthropometric factors and change of direction speed

Only a limited amount of research has been carried out that has attempted to find the relationship between anthropometric parameters and performance in the change of direction speed. Theoretically, factors such as body fat and length of body segments can affect agility performance. If we compare two athletes with the same body weight, the one with the higher 20 Definition of terms 17 percentage of body fat will have less active muscle mass contributing to speed requirements on agility performance.

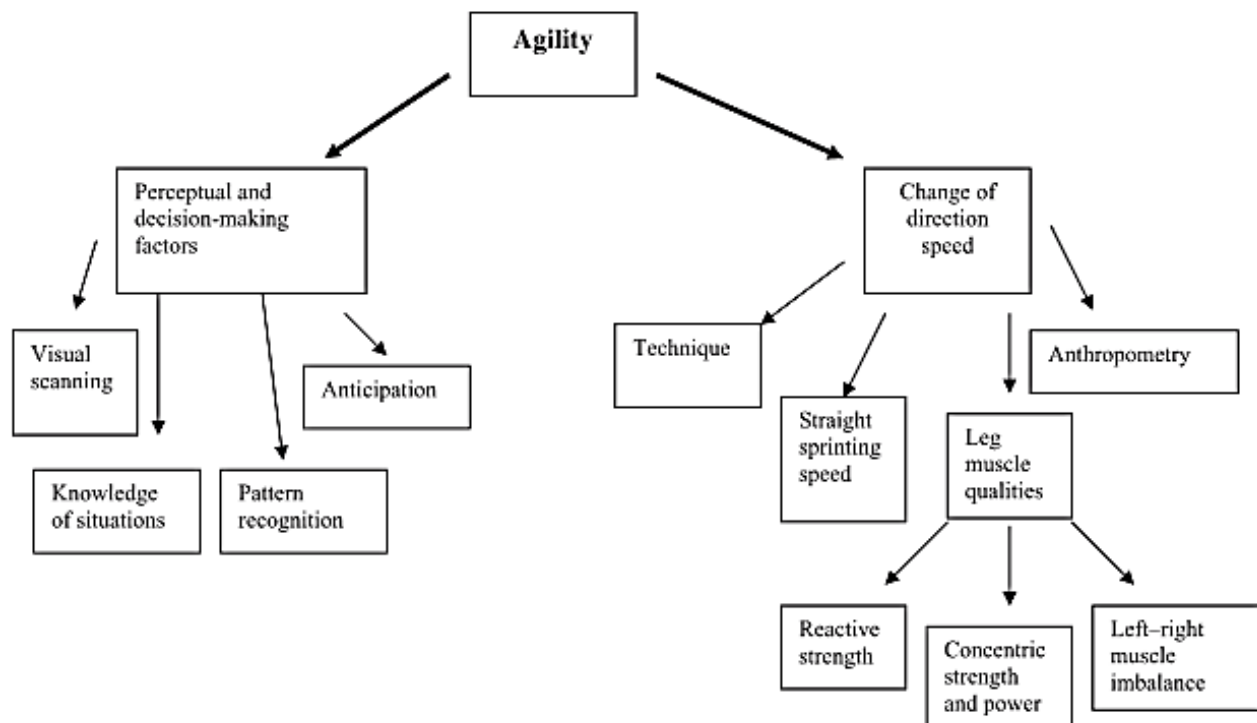


Figure 2.1: Universal Agility Components (Modified from Young et al., 2002)

2.6 Testing agility

The vast majority of tests purported to assess agility are tests for change of direction speed, as acknowledged by Ellis et al. in Gore (2000, p. 132): The basic movement patterns of many team sports require the player to perform sudden changes in body direction in combination with rapid movement of limbs. The ability of the player to use these maneuvers successfully in the actual game will depend on other factors such as visual processing, timing, reaction time, perception, and anticipation.

Although all these factors combined are reflected in the player's on-field "agility", the purpose of most agility tests is simply to measure the ability to rapidly change body direction and position in the horizontal plane. As part of her ongoing training series, Art of Coaching fitness editor Marie Zidek demonstrates 6 volleyball agility drills designed to increase speed and overall mobility.

1. Figure 8 backpedal with sprint

This volleyball agility drill helps players make quicker direction changes. It's particularly useful for movements that have to be made when a ball is deflected or comes off a blocker's hands.

2. Cone hop with backpedal

The exercise Marie introduces here involves jumping back and forth laterally over a row of cones: 3 cones for younger athletes, 5 or more for older athletes who have been playing volleyball longer. This is a good injury prevention exercise because it trains the body to land from jumps in a controlled manner.

3. Forward lateral backpedal

This volleyball agility exercise involves changes of direction, from forward sprints to lateral shuffles. This is a good strength builder for the many quick moves players have to make in volleyball.

4. T Drill

Appropriately named, the T Drill requires athletes to sprint a course shaped like a "T". The example here is a mix of forward sprints and shuffles, but as Marie points out, coaches can be creative and include any number of volleyball-like moves.

The purposes of this drill are to work on smooth changes of direction, quick starts and stops and spacial awareness that allows players to stay focused on the game.

5. Y Drill

Similar to the "T Drill," the "Y Drill" builds strength, speed and agility for quick direction changes and helps volleyball athletes develop spatial awareness.

6. Square

In this agility drill, 4 cones are placed to form a square, and the athlete moves quickly from the middle of the square to each cone and back. Variations include having a coach point to the cone where the athlete should go next. This adds an extra challenge and simulates a volleyball play by requiring the player to make head-up movements and focus on something besides footwork.

3. METHODOLOGY OF THE STUDY

3.1. The study area

Wolaita Sodo University is located around 360km to south of the capital city of Ethiopia, Addis Ababa. The administrative center of the Wolaita Zone of the Southern Nations, Nationalities, and Peoples Region, it is 360 KM far the capital city of Ethiopia, it has a latitude and longitude of 6°54'N 37°45'E/ 6.900°N 37.750°E with an elevation between 1,600 and 2,100 meters (5,200 and 6,900 feet) above sea level. It was part of the former Sodo Woreda which included Sodo Zuria which completely surrounds it. Wolaita Sodo University has 58 undergraduate programs, 43 postgraduate programs, 6 Doctor of Philosophy programs, and 4 Medical specialty programs.

Wolaita Sodo University was established on 24 March 2007 by proclamation. The university started its duty with 16 undergraduate programs and 807 students. Now over 35,000 active students; until 2019 the university has graduated 57,188 students. There are 1,626 Academic, and 3,770 Administrative staff.

The university has been involved in community service activities by designing problem solving projects that can ensure the benefit of the community in various fields and based on questions from the community. One of the 87 community service projects approved in 2019 is the digging of deep water wells in Wolayita Zone, Sodo, Bodit, Gununo and Bele towns.

According to Dr. Mesfin Bibiso, Vice President for Research and Community Service and Associate Deans of Colleges and Schools, experts have proved that the deep well drilling carried out with the support of the community service project is effective and generates 16 liters of water per second, or 1,382,000 liter per day. He said that the previous water supply in the town was 5 liters per second, which is very limited in terms of the city's population, adding that it has been put in place to alleviate the problems of the community.

According to experts, the project, which was implemented in Gununo town on Thursday, 1 October 2020 generates 1,382,000 liters of water per day and will be accessible to more than 130,000 households. As the university stated its "the project is expected to be implemented in Sodo, Boditi and Bale towns of the zone soon".

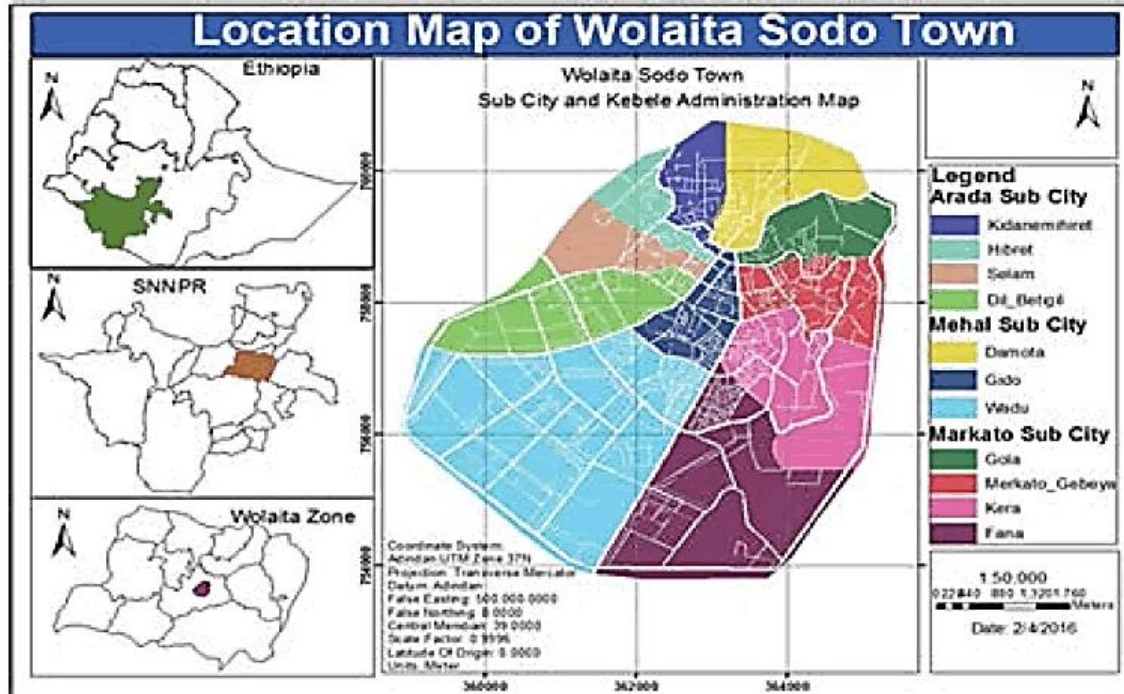


Figure 3. 1: Google map of Wolaita Sodo

Source: Sodo town Municipality (2015)

3.2 Research Design

The study was designed to find the relationship between agility and jumping ability of Female Volleyball clubs representing Wolaita Sodo University. Based on this, the researcher used cross-sectional and experimental research designs in order to collect data from Wolaita Sodo University female volleyball club players.

3.3 Variables of the Study

The main variables of this study were jumping ability. The Sargent Jump Test (Sargent 1921), also known as the vertical jump test, was developed by Dr. Dudley Allen Sargent (1849-1924).

The dependent variable this study was agility. The standardized warm-up performed was: dynamic movements in order to properly warm up the body before testing. Sub-maximal jumps, active and dynamic stretching, and dynamic motions emphasizing quadriceps and hamstrings as agonistic muscle groups were included in the sport-specific warm-up. All athletes experienced an

identical warm-up protocol prior to any testing procedures to limit the potentially confounding effect of using different warm-up procedures.

3.3. Population

The study population is the subset of the target population available for study (e.g. schizophrenics in the researcher's town). The study sample is the sample chosen from the study populations which are 18 in numbers. Therefore, the subjects of the study were Wolaita Sodo university female volleyball team players.

3.4. Source of Data

For this study researcher used Wolaita Sodo University female volleyball team players as primary data source.

3.5 Sample Size and Sampling Technique

A total of 12 Female Volleyball clubs were obtained to collect the relevant data using purposive sampling technique from 18 target population (players).

3.6 Data Collection Instrument

The t-test was used for agility and electronic device was used for vertical jump. The materials defined in context of this study were stopwatch, metric tape, boundary cones, chalks and markers.

3.6.1 Recording converting interpreting and evaluating the score

Initially, the data were written on individual sheet cards. Secondly, the data was transferred from the individual score sheet to the role sheet. Thirdly, the data that was written on the role sheet was converted to a percentile. Finally, the recorded data was evaluated. The standardized warm-up performed was: dynamic movements in order to properly warm up the body before testing. Sub-maximal jumps, active and dynamic stretching, and dynamic motions emphasizing quadriceps and hamstrings as agonistic muscle groups were included in the sport-specific warm-up. All athletes experienced an identical warm-up protocol prior to any testing procedures to

limit the potentially confounding effect of using different warm-up procedures. All participants were asked to not participate in any physical activity 24 hours prior to testing.

3.6.2 Agility T-Test

Purpose: the T-Test is a test of agility for athletes, and includes forward, lateral, and backward running.

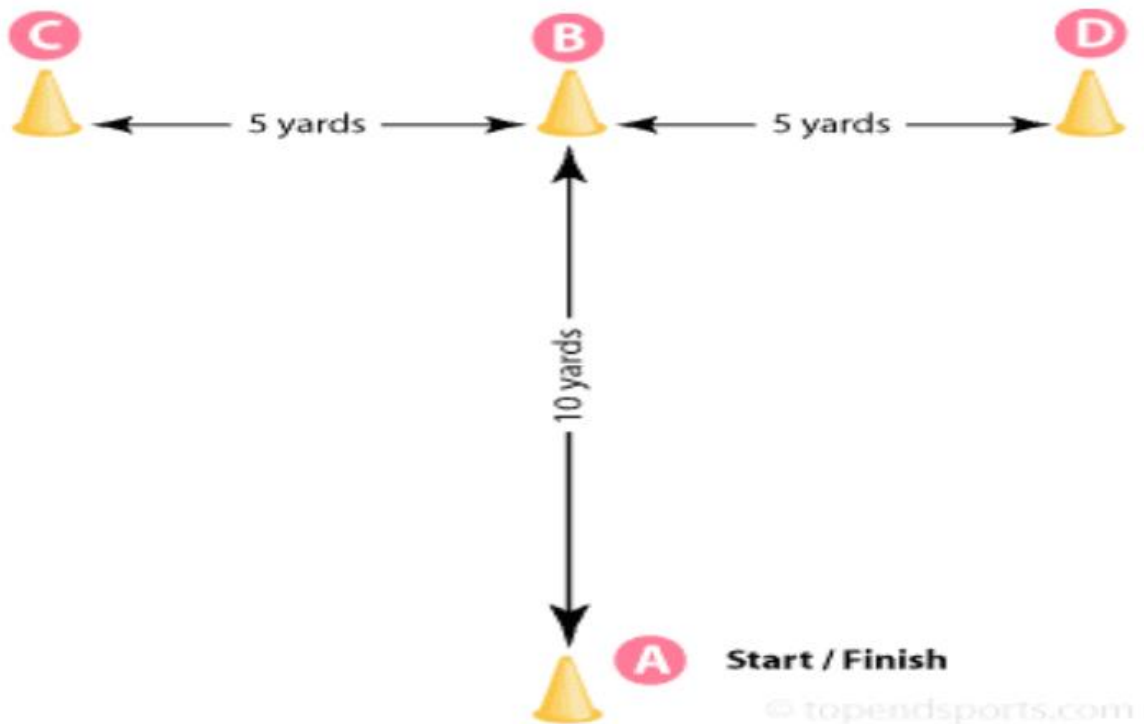


Figure 3. 2: Agility T-test

Procedure: Set out four cones as illustrated in the diagram above (5 yards = 4.57 m, 10 yards = 9.14 m). The subject starts at cone A. On the command of the timer, the subject sprints to cone B and touches the base of the cone with their right hand. They turn left and shuffle sideways to cone C, and also touch its base, this time with their left hand. Then shuffling sideways to the right to cone D and touching the base with the right hand. Then they shuffle back to cone B touching with the left hand and run backwards to cone A. The stopwatch is stopped as they pass cone A.

Scoring: The trial will not be counted if the subject crosses one foot in front of the other while shuffling, fails to touch the base of the cones, or fails to face forward throughout the test. Take the best time of three successful trials to the nearest 0.1 seconds. The table below shows some scores for adult team sport athletes.

Table 3.1: Scores for adult team sport athletes

Score	Males (Seconds)	Females (Seconds)
Excellent	< 9.5	< 10.5
Good	9.5 to 10.5	10.5-11.5
Average	10.5-11.5	11.5-12.5
Poor	> 11.5	> 11.5

Ensure that the subjects face forwards when shuffling and do not cross the feet over one another. For safety, a spotter should be positioned a few meters behind cone A to catch players in case they fall while running backward through the finish.

The type of surface that is used should be consistent to ensure good test retest reliability.

This is a simple agility test to perform, requiring limited equipment and space. Only one person can perform the test at a time.

Sargent Jump Test

Testing and measurement are the means of collecting information upon which subsequent performance evaluations and decisions are made, but in the analysis we need to bear in mind the factors that may influence the results. The Sargent Jump Test (Sargent 1921), also known as the vertical jump test, was developed by Dr. Dudley Allen Sargent (1849-1924).

- **Objective:** to monitor the development of the athlete's elastic leg strength.
- **Required Resources:** to undertake this test you will require: wall, tape measure, step ladder, chalk & assistant.

- **How To conduct The Test :** the athlete warms up for 10 minutes; the athlete chalks the end of his/her finger tips; the athlete stands side onto the wall, keeping both feet remaining on the ground, reaches up as high as possible with one hand and marks the wall with the tips of the fingers (M1); the athlete from a static position jumps as high as possible and marks the wall with the chalk on his fingers (M2); the assistant measures and records the distance between M1 and M2; the athlete repeats the test 3 times and the assistant calculates the average of the recorded distances and uses this value to assess the athlete's performance.

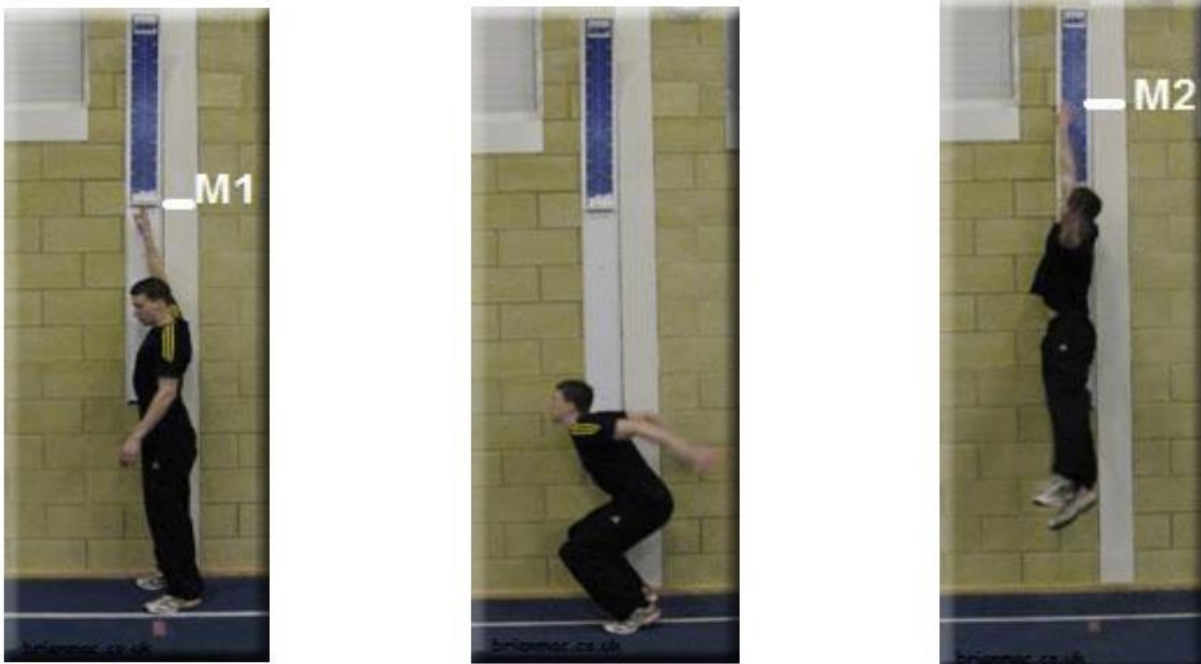


Figure 3. 3: Vertical Jump Test

- **Normative Data**

The following normative data (Chu 1996) have been obtained from the results of tests conducted with world class athletes.

Table 3.2: Normative data for world class athletes

% Rank	Females	Males
91-100	76.20 - 81.30 cm	86.35 - 91.45 cm
81-90	71.11 - 76.19 cm	81.30 - 86.34 cm
71-80	66.05 - 71.10 cm	76.20 - 81.29 cm
61-70	60.95 - 66.04 cm	71.10 - 76.19 cm
51-60	55.90 - 60.94 cm	66.05 - 71.09 cm
41-50	50.80 - 55.89 cm	60.95 - 66.04 cm
31-40	45.71 - 50.79 cm	55.90 - 60.94 cm
21-30	40.65 - 45.70 cm	50.80 - 55.89 cm
11-20	35.55 - 40.64 cm	45.70 - 50.79 cm
1-10	30.50 - 35.54 cm	40.65 - 45.69 cm

The following are national norms for 16 to 19 year olds (Davis, 2000).

Table 3.3: Normative data for 16 to 19 year old athletes

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>65cm	50-65cm	40-49cm	30-39cm	<30cm
Female	>58cm	47-58cm	36-46cm	26-35cm	< 26cm

The following table is for 15 to 16 year olds (Beashel 1997).

Table 3.4: Normative data for 16 to 19 year old athletes

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>65cm	50-65cm	50-55cm	40-49cm	<40cm
Female	>60cm	51-60cm	41-50cm	35-40cm	< 35cm

The following table is for adult athletes (20+) (Arkinstall, 2010)

Table 3.5: Normative data for more than 20 years old athletes

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	> 70cm	56-70cm	41-55cm	31-40cm	<30cm
Female	> 60cm	46-60cm	31-45cm	21-30cm	<20 cm

Analysis of the test result is by comparing it with the athlete's previous results for this test. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's leg strength.

3.7. Method of data analysis

SPSS 29.0.1 Statistical program was used for evaluation and calculation of the data. We summarized the data and evaluated the means and standard deviations. To explain relationship between measurements, Pearson correlation analysis was used according to the results of the test of normality, and linear regression analysis was used to predictive power of explanation. The significance level was taken as 0.05.

3.8 Ethical Considerations

The researcher assured the respondents of confidentiality, anonymity and privacy. Before administering the research instrument, the respondents this study was brief on their requirements and the procedure for responding to the items. Emphasis this study was to place on voluntary participation and that the respondents were at liberty to withdraw from the study if they were not comfortable. A promise to access the study results after completion was given to the respondents.

4. RESULTS AND DISCUSSIONS

After collecting the reliable data the researcher had tabulated and analyzed it. Tabulation is a way of arranging the same data in some kind of concise and logical order. The researcher had conducted the task of drawing inferences after analyzed the collected data. Unless this has been done very carefully, misleading conclusions may be drawn and the whole purpose of doing research may get vitiated. It is only through interpretation that the researcher can expose relations and processes that underlie these findings.

This chapter reveals results and interpretation of the research under taken. The data was analyzed by using tables and descriptive statements. SPSS 29.0.1.0.(171) statistical program was used for evaluation and calculation of the data. The data was summarized and evaluated the means and standard deviations. To explain relationship between measurements, Pearson correlation analysis was used according to the results of the test of normality, and linear regression analysis was used to predictive power of explanation on vertical jump of agility, acceleration and sprint ability. The significance level was taken as 0.05.

4.1 Result

4.1.1 Descriptive statistics of volleyball players

I. Age of players in Years

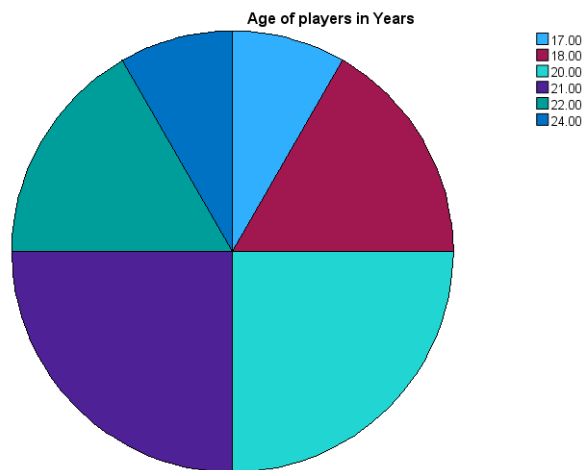


Figure 4. 1: Pie-chart for age of players in years

Table 4. 1: Descriptive analysis for age of players in Years

		Statistic	Std.	
Age of players in Years	Mean	20.3333	.56854	
	95% Confidence Interval for Mean	Lower Bound	19.0820	
		Upper Bound	21.5847	
	5% Trimmed Mean	20.3148		
	Median	20.5000		
	Variance	3.879		
	Std. Deviation	1.96946		
	Minimum	17.00		
	Maximum	24.00		
	Range	7.00		
	Interquartile Range	3.25		
	Skewness	-.044	.637	
	Kurtosis	-.058	1.232	

The mean (SD) age was 20.33±1.96946 years

II. Weight of Players in Kilograms

Table 4. 2: Descriptive analysis weight of Players in Kg

		Statistic	Std.	
Weight of Players in Kg.	Mean	61.2583	1.09000	
	95% Confidence Interval for Mean	Lower Bound	58.8593	
		Upper Bound	63.6574	
	5% Trimmed Mean	61.1759		
	Median	60.5000		
	Variance	14.257		
	Std. Deviation	3.77587		
	Minimum	56.00		
	Maximum	68.00		
	Range	12.00		
	Interquartile Range	6.35		
	Skewness	.578	.637	
	Kurtosis	-.610	1.232	

The mean (SD) weight was 61.2583±3.77587 Kg.

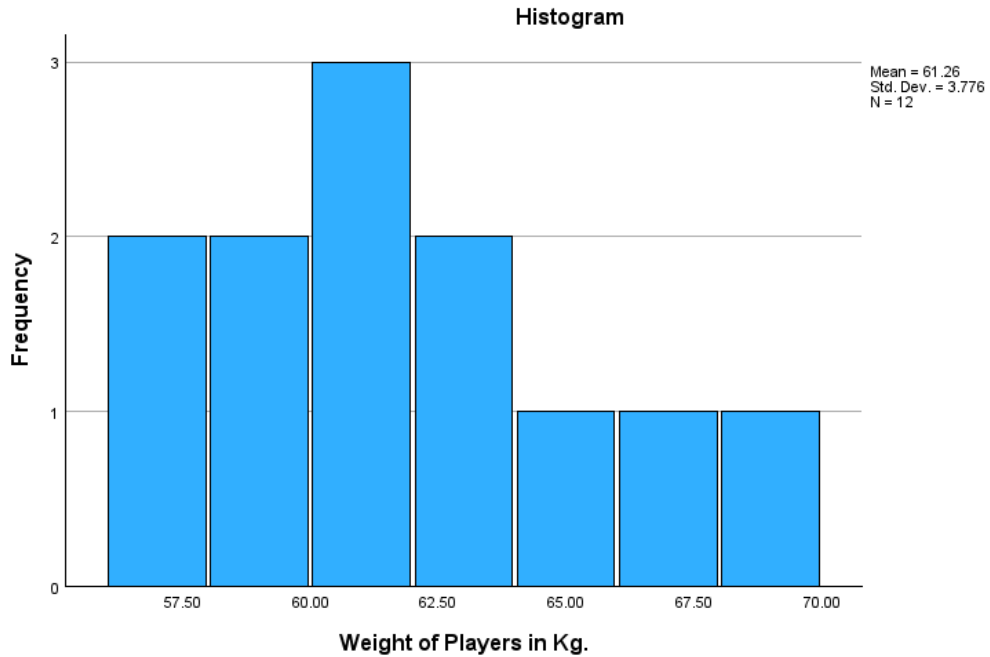


Figure 4. 2: Histogram for weight of players in kilogram

III. Height of players in meters

Table 4. 3: Descriptive analysis for height of players in meters

		Statistic	Std.	
Height of players in meters	Mean	1.7275	.01149	
	95% Confidence Interval for Mean	Lower Bound	1.7022	
		Upper Bound	1.7528	
	5% Trimmed Mean	1.7289		
	Median	1.7300		
	Variance	.002		
	Std. Deviation	.03980		
	Minimum	1.65		
	Maximum	1.78		
	Range	.13		
	Interquartile Range	.06		
	Skewness	-.505	.637	
	Kurtosis	-.275	1.232	

The mean (SD) height was 1.7275±0.0398 m.

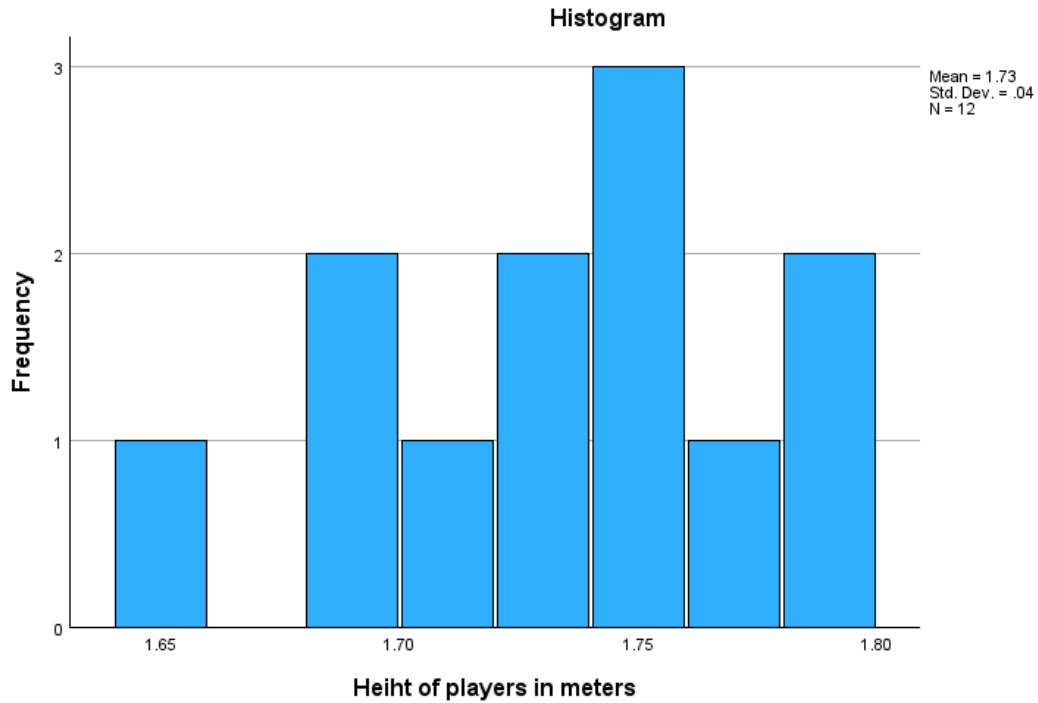


Figure 4. 3: Histogram for height of players in meters

IV. Jumping Height of Players in centimeters

Table 4. 4: Descriptive analysis for jumping height of players in centimeters

		Statistic	Std. Error	
Jumping Height of Players in cm.	Mean	543.8333	20.86023	
	95% Confidence Interval for Mean	Lower Bound	497.9203	
		Upper Bound	589.7464	
	5% Trimmed Mean	540.0926		
	Median	508.5000		
	Variance	5221.788		
	Std. Deviation	72.26194		
	Minimum	475.00		
	Maximum	680.00		
	Range	205.00		
	Interquartile Range	120.50		
	Skewness	.955	.637	
	Kurtosis	-.736	1.232	

The mean (SD) jumping height of players was 543.8333± 72.26194 cm.

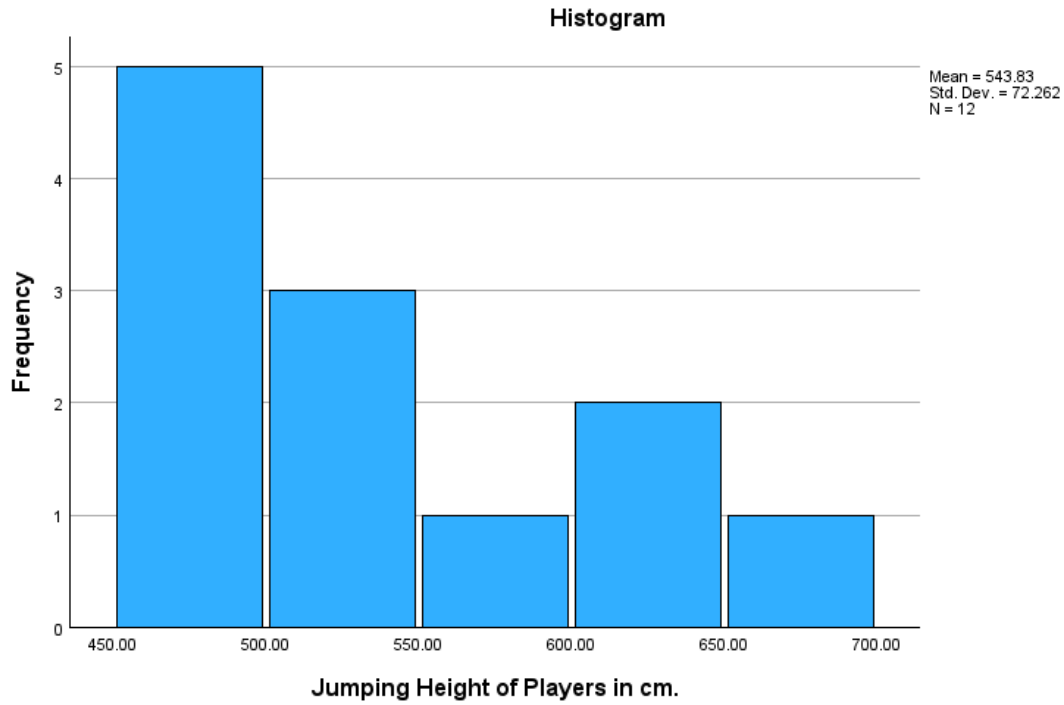


Figure 4. 4: Histogram for jumping height of players in centimeters

V. Agility of players in Seconds

Table 4. 5: Descriptive analysis for agility of players in seconds

		Statistic	Std. Error	
Agility of players in Seconds	Mean	11.2583	.23596	
	95% Confidence Interval for Mean	Lower Bound	10.7390	
		Upper Bound	11.7777	
	5% Trimmed Mean	11.2870		
	Median	11.2000		
	Variance	.668		
	Std. Deviation	.81738		
	Minimum	9.80		
	Maximum	12.20		
	Range	2.40		
	Interquartile Range	1.50		
	Skewness	-.423	.637	
	Kurtosis	-1.067	1.232	

The mean (SD) agility of players was 11.2583± 081738Sec.

4.1.2 Regression and Correlation Analysis

Table 4. 6: Descriptive statistics (mean, SD) for jumping height and agility of players

	Mean	Std. Deviation	N
Jumping Height of Players in cm.	543.8333	72.26194	12
Agility of players in Seconds	11.2583	.81738	12

Table 4. 7: Correlation between jumping height and agility of players

		Jumping Height of Players in cm.	Agility of players in Seconds
Pearson Correlation	Jumping Height of Players in cm.	1.000	-.781
	Agility of players in Seconds	-.781	1.000
Sig. (1-tailed)	Jumping Height of Players in cm.	.	.001
	Agility of players in Seconds	.001	.
N	Jumping Height of Players in cm.	12	12
	Agility of players in Seconds	12	12

Table 4. 8: ANOVA for jumping height and agility of players

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	35015.722	1	35015.722	15.615	.003 ^b
	Residual	22423.944	10	2242.394		
	Total	57439.667	11			

a. Dependent Variable: Jumping Height of Players in cm.

b. Predictors: (Constant), Agility of players in Seconds

Table 4. 9: Correlation statistics for jumping height and agility of players

Coefficients ^a											
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1320.951	197.132		6.701	<.001					
	Agility of players in Seconds	-69.026	17.468	-.781	-3.952	.003	-.781	-.781	-.781	1.000	1.000

a. Dependent Variable: Jumping Height of Players in cm.

As shown in the table meaningful in the regression results of agility for vertical jumping .There is a significant correlation between the variables. A unit increase in agility lead to a change -.781 units in vertical jumping performance.

Table 4.10: Correlation coefficients for jumping height and agility of players

Model			Agility of players in Seconds
1	Correlations	Agility of players in Seconds	1.000
	Covariance	Agility of players in Seconds	305.122

a. Dependent Variable: Jumping Height of Players in cm.

Table 4.11: Residual statistics for jumping height of players

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	478.8339	644.4962	543.8333	56.42028	12
Residual	-80.56763	49.82198	.00000	45.15020	12
Std. Predicted Value	-1.152	1.784	.000	1.000	12
Std. Residual	-1.701	1.052	.000	.953	12

a. Dependent Variable: Jumping Height of Players in cm.

Table 4. 12: Generalized report between variables

Jumping Height of Players in cm.									
Agility of players in Seconds	Mean	N	Std. Deviation	Minimum	Maximum	Range	Variance	% of Total N	Harmonic Mean
9.80	680.0000	1	.	680.00	680.00	.00	.	8.3%	680.0000
10.20	630.0000	1	.	630.00	630.00	.00	.	8.3%	630.0000
10.50	646.0000	1	.	646.00	646.00	.00	.	8.3%	646.0000
10.90	502.0000	2	19.79899	488.00	516.00	28.00	392.000	16.7%	501.6096
11.20	475.0000	1	.	475.00	475.00	.00	.	8.3%	475.0000
11.30	590.0000	1	.	590.00	590.00	.00	.	8.3%	590.0000
11.90	501.0000	1	.	501.00	501.00	.00	.	8.3%	501.0000
12.00	498.0000	1	.	498.00	498.00	.00	.	8.3%	498.0000
12.10	506.5000	2	23.33452	490.00	523.00	33.00	544.500	16.7%	505.9625
12.20	489.0000	1	.	489.00	489.00	.00	.	8.3%	489.0000
Total	543.8333	12	72.26194	475.00	680.00	205.00	5221.788	100.0%	535.8312

Table 4. 13: ANOVA table

		Sum of Squares	Df	Mean Square	F	Sig.
Jumping Height of Players in cm. * Agility of players in Seconds	Between Groups	(Combined) 56503.167	9	6278.130	13.408	.071
	Within Groups	936.500	2	468.250		
	Total	57439.667	11			

Table 4. 14: Measures of association between variables

Measures of Association		
	Eta	Eta Squared
Jumping Height of Players in cm. * Agility of players in Seconds	.992	.984

4.2 Discussion

The current study explored the association between agility and jumping ability in female volleyball clubs, given the critical role these skills play in volleyball performance. This study found that the mean jumping height of players was 543.83 cm ($SD \pm 72.26$), while agility averaged 11.26 seconds ($SD \pm 0.82$) across 12 female volleyball clubs. Notably, a significant relationship was identified between vertical jump performance and agility ($P < 0.05$), emphasizing how closely these physical abilities are intertwined in high-level volleyball performance.

Sports like basketball and volleyball are characterized by high ground reaction forces, particularly when players land from jumps. Vertical jumping is integral to these sports, not only as a measure of athleticism but also as a key performance factor, especially for maneuvers like spiking and blocking in volleyball. Research supports that vertical jumping ability is not static but can improve with targeted training. For instance, one study reported a progressive increase in countermovement jump heights in female volleyball players, with mean jump heights rising from 28.70 cm ($SD \pm 2.50$) in the first week to 34.29 cm ($SD \pm 3.57$) by the 24th week of training. Marques et al. (2008) similarly found a mean countermovement jump increase from 34.22 cm ($SD \pm 5.90$) to 35.56 cm ($SD \pm 6.28$) after a 12-week training period in professional female volleyball players competing at national and European levels.

Jumping ability is closely tied to power, a product of strength and speed, which makes it a complex measure of athletic capacity. Developing power requires enhancing both the speed and strength components, as they contribute multiplicatively to power output. For volleyball players, optimizing power through agility and vertical jump training is essential for peak performance, directly impacting their ability to perform critical movements like quick changes in direction and explosive jumping maneuvers.

Mero et al. (1981) explored the connection between sprinting and jumping abilities, finding a significant correlation rooted in the mechanical characteristics of fast-twitch muscle fibers. These muscle fibers, more prevalent in sprinters, facilitate rapid, explosive movements, supporting both sprinting and jumping capacities. Their findings emphasized that athletes with a higher distribution of fast-twitch fibers tended to excel in both jumping and sprinting tasks, highlighting the importance of muscle composition in athletic performance.

In another study, female athletes from various team sports (football, basketball, volleyball, and handball) demonstrated mean performance metrics, including a countermovement jump height of 29.49 cm ($SD \pm 5.09$), agility timing of 11.92 seconds ($SD \pm 0.52$), and a 10-m straight sprint time of 2.33 seconds ($SD \pm 0.10$). This study noted a low correlation between agility and vertical jump as well as between agility and sprint tests in women, suggesting that these metrics might measure distinct aspects of physical ability that do not necessarily overlap in female athletes.

Other research also provided sprint times across different distances, with a mean sprint time of 1.05 seconds ($SD \pm 0.05$) for a 5-m dash (Wnorowski, 2007) and 1.68 seconds ($SD \pm 0.095$) for a 10-yard dash (9.14 m) (Morrow et al., 1980). Song (1982) investigated the link between defensive movements and physical performance in elite women's volleyball teams in China, finding that defensive movements were significantly associated with speed. His regression analysis highlighted the critical role of speed in effective defensive play.

Furthermore, T-test agility improvements were observed in women's intercollegiate volleyball players during the 2005–2006 season, showing significant enhancement from preseason baseline values (10.01 seconds, $SD \pm 0.6$) to the end of the preseason (9.69 seconds, $SD \pm 0.6$). By the season's competitive phase, agility continued to improve (9.17 seconds, $SD \pm 0.8$), emphasizing the progressive agility gains over the season (Journal of Applied Sport Science Research, 1991). These findings collectively illustrate the interdependence of agility, speed, and power for high-level volleyball performance, especially as athletes adapt to training and competitive demands over time.

In this study, agility running times demonstrated a modest but significant correlation with countermovement jump (CMJ) heights ($r = 0.2583$), with jump height accounting for 11% of the variance in agility performance. This relationship suggests that while CMJ height impacts agility, other factors contribute to overall agility performance. Supporting this, Barnes et al. (2007) identified a link between jumping and agility, emphasizing that CMJ height was strongly correlated with drop jump height, reactive strength index, and peak force in isometric leg extension factors that influence rapid direction changes and explosive movements in sports like volleyball.

However, findings on the correlation between jumping and agility vary. Young et al. (1996) reported a low and non-significant correlation between vertical jump and a 20-m change of direction test, suggesting that specific types of jumps may not always predict agility in tasks requiring extensive directional changes. In contrast, Peterson et al. (2006) observed a significant correlation between T-test scores and vertical jump in women, reinforcing that, under certain conditions, vertical jumping ability may correlate with agility assessments.

Further studies have shown nuanced relationships between these variables. Pauole et al. (2000) found low to moderate significant correlations ($p < 0.05$) between the T-test (a measure of agility) and both 40-yard sprint times ($r = 0.73$) and vertical jump heights ($r = 0.55$) for women, highlighting a modest association between sprinting, agility, and jumping abilities. Speed, a key component of agility, involves accelerating from a static position, requiring initial power output and muscular endurance to sustain it (Sharkey and Gaskill, 2006). This suggests that while agility and vertical jump are related, agility encompasses additional attributes like speed endurance and directional control, which together contribute to athletic proficiency.

Vertical jump performance is influenced by both neural and muscular factors. To achieve a higher jump, athletes must maximize vertical acceleration before takeoff. This initial acceleration determines the jump's initial vertical velocity; the greater the velocity, the higher the center of mass reaches. To generate this acceleration effectively, athletes need to apply maximum force over the shortest possible period, optimizing power output (Ziv & Lidor, 2010).

In terms of performance tests, however, not all measures of speed and agility correlate strongly with jumping ability. For instance, Peterson et al. (2006) found a low correlation between the T-test (a standard agility measure) and both acceleration (measured by the 20-yard split of a 40-yard sprint) and overall sprint velocity (40-yard sprint) in women. This finding suggests that while sprinting and acceleration rely heavily on power and speed, they may involve different muscular and neural contributions compared to those required for vertical jumping. This distinction underscores that agility, sprinting, and vertical jumping, though related, are distinct aspects of athletic performance that each draw on specific physical and neuromuscular skills.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

This study aimed to assess the relationship between agility and jumping ability in female volleyball clubs at Wolaita Sodo University. To achieve this objective, cross-sectional and experimental research designs were employed to collect data from the university's female volleyball team. Primary data were sourced from Wolaita Sodo University female volleyball players. Data collection instruments included the T-test for agility and an electronic device for measuring vertical jump height. Equipment used in the study included a stopwatch, metric tape, boundary cones, chalk, and markers. Data were recorded on individual sheets, transferred to a roll sheet, converted to percentiles, and then evaluated.

A standardized warm-up was provided, which included dynamic movements, sub-maximal jumps, active and dynamic stretching, and exercises targeting the quadriceps and hamstrings. Participants were instructed to refrain from any physical activity 24 hours prior to testing.

The players' ages ranged from 17 to 24 years, with a mean age of 20.33 ± 1.97 years. Their mean height was 1.7275 ± 0.3980 meters, and their weight ranged from 57 to 70 kg, with a mean of 61.26 ± 3.78 kg. Jumping heights varied between 450 and 700 cm, with a mean of 543.83 ± 72.26 cm. Agility times ranged from 9.8 to 12.2 seconds, with a mean of 11.26 ± 0.82 seconds.

In summary, the findings indicate a strong positive relationship between agility and vertical jumping ability among Wolaita Sodo University female volleyball players. The study successfully demonstrated that agility performance in volleyball players is positively associated with vertical jump performance.

5.2 Conclusion

In conclusion, this research demonstrated that vertical jump performance positively impacts agility in female volleyball players. The relationship between jump performance and agility is crucial in volleyball, as it enables players to produce high-force, rapid stretch-shortening cycle movements and execute high-speed, full-body movements. The importance of vertical jump and agility assessments is growing across various sports as they provide key insights into an athlete's performance capabilities. While vertical jump and agility measures are effective in training volleyball teams, the specific relationship between these factors should be further explored in longitudinal studies to optimize training outcomes over time.

This study supports the integration of agility, acceleration, and sprint-focused training programs for improving vertical jump performance in a cost-effective manner, with minimal equipment requirements. Coaches can leverage these findings to incorporate tailored agility and sprint exercises to boost vertical jump capabilities in volleyball players.

Additionally, the research found a significant correlation between sprint performance and jumping tests, which aligns with the mechanical characteristics of fast-twitch muscle fibers. Athletes with a higher distribution of fast-twitch fibers often excel in both sprinting and jumping activities, highlighting the impact of muscle composition on physical performance. Studies indicate that agility, vertical jump, and short sprints are significantly interrelated in women, driven by factors like acceleration from a static position, power, and muscular endurance. Vertical jump, influenced by both neural and muscular factors, depends on achieving maximum vertical acceleration and velocity. However, previous findings show a low correlation between agility tests, such as the T-test, and both acceleration (20-yard split in a 40-yard sprint) and sprint velocity (40-yard) in women, suggesting that agility and jump performance, though related, involve distinct physical attributes. Overall, the current research underscores the interconnectedness of agility, vertical jump, and speed as critical components of athletic performance.

5.3 Recommendation

- Based on the promising findings of this study, future research should address variables such as age, weight, height, and training age to deepen the understanding of factors influencing agility and vertical jump performance in volleyball players. Incorporating these elements could make the research even more impactful.
- Additionally, further investigation into scientific training methodologies will be essential to improve the vertical jump performance of female volleyball players at Wolaita Sodo University (WSU), ultimately enhancing their skills in blocking, serving, and smashing.
- The primary goal in training to improve vertical jump is to maximize the body's vertical velocity at takeoff. Coaches should focus on agility training, helping volleyball players generate greater ground force per unit of time and minimize ground contact time before takeoff.
- Continued research is needed to evaluate players' agility and vertical jump performance across different seasons preseason, competition season, and offseason—to understand how performance fluctuates and to tailor training accordingly.
- In future studies, researchers should aim to increase the sample size to enhance the generalizability of the results, thereby strengthening the study's conclusions for broader applications.

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APPENDICES

Appendix-A

Wolaita Sodo University

College of Natural and Computational science

Department of sport science

Appendix-A: Questionnaire to Wolaita Sodo University Female Volleyball Project Coaches

Dear participants, the purpose of this questionnaire is to collect the necessary data from you about the relationships between agility and jumping ability of Female Volleyball clubs in Wolaita Sodo University Female Volleyball Club. The Information provided by you will be confidential and only be used for this research work.

Thank you in advance for your cooperation to respond and fill questionnaire!

Part I. Personal Information

Instruction: Write your responses in the space provided below.

Name of the Volleyball project-----

1. Age -----
2. Sex: Male Female
3. Educational Status-----
4. Years of experience -----

Part II- Open ended questionnaire

1. Training load given to you per week is _____
A. 2 days B. 3 days C. 4 days D. 5 days
2. The training session time used per day is _____
A. 1 hr. B. 2 hrs. C. 3 hrs. D. 4 hrs.

Appendix B: A Check-List for the Descriptive and Performance Characteristics of Female Volleyball clubs of Wolaita Sodo University Female Volleyball Club

S.No.	Volleyball player's code	Age(yrs.)	Height (cm)	Body Weight(Kg)	Before Training (Base line measurement)		After Training	
					Variables		Variables	
					Vertical Jump (cm)	Agility (s)	Vertical Jump (cm)	Agility (s)
1	P1							
2	P2							
3	P3							
4	P4							
5	P5							
6	P6							
7	P7							
8	P8							
9	P9							
10	P10							
11	P11							
12	P12							

አባራት ለተሳታፊዎች መረጃ መሰጫ እና የስምምነት ፎርም

የተከበራችሁ የመረብ ኪስ ፕሮጀክት ቡድን አባላት፡- ይህ መረጃ መሰጫ እና የስምምነት ፎርም “በወላይታ ሶዶ ዩኒቨርሲቲ የሴት ሾሊቦል ክለብ ውስጥ የሴት ሾሊቦል ተጨዋቾች በብቃትና በመዝለል መካከል ያሉ ግንኙነቶች”. በሚል ርዕስ ላይ በሚደረግ ጥናትና ምርምር መረጃ ለመሰብሰብ የተዘጋጀ ሲሆን የእርስዎ ቀና ምላሽ ለጥናቱ ቅደም ተከተልና ስኬት እስተዋፅኦ ከፍተኛ በመሆኑ እርስዎ ለዚህ ጥናት አንድ አካል በመደረግ ተመርጠዋል።

የጥናቱ ጠቀሜታ

የዚህ ጥናት ዉጤት የሚጠቅመው ለሰልጣኞችና ለማህበረሰቡ እንዴትና ተገቢ የሆኑት የሰልጠና ፕሮግራም በማቀድ የመረብ ኪስ ቴክኒኮችን ለማሳደግ በከፍታ ዝላይና በቅልጥፍና እንቅስቃሴ ችሎታ ማጎልበት ነው። ከዚህም በተጨማሪ የዚህ ጥናት አላማ የ2ኛ ዲግሪ ፕሮግራምን በመረብ ኪስ ስፔሻላይዜሽን በማጥናት እና ለስፖርት ትምህርት ክፍል በማስገባት በመረብ ኪስ ስፔሻላይዜሽን ለመመረቅ ነው።

2. ቅድም ተከተልና ቆይታ

የተለያዩ የመረብ ኪስ ቴክኒኮች ላይ በቅድሚያ በከፍታ ዝላይ ችሎታ ማጎልበትና በመጨረሻም የቅልጥፍና እንቅስቃሴዎች ተመርጠዋል። በመሆኑም ከዋናው የሰልጠና ፕሮግራም ዉጭ በእነዚህ ሁለት የተመረጡ የመረብ ኪስ ቴክኒኮችን የከፍታ ዝላይና ተጨማሪ ቅልጥፍናን መሰረት ያደረገ ሥልጠና እንድትወስዱ ይደረጋል። በመሆኑም ሙከራ የሚደረግባችሁ ቡድኖች ከ40 ደቂቃ ያልበለጠ ተከታታይ ያልሆኑ በሰዓት 3 ጊዜ ትወስዳላችሁ።

3. ችግሮችና ጥቅሞች

በዚህ ጥናት ሊይ የሚያጋጥሙ ችግሮች በጣም አናሳ ናቸው። ስለሆነም በሰልጠና ወቅት ወለምታ፣ መውደቅ፣ መጋጥ እና መድማት ሊያጋጥሙት ይችላሉ። ምንክልባትም እነዚህ ችግሮች ቢያጋጥማችሁ ተገቢ የሆነ የመጀመሪያ ደረጃ ህክምና እርዳታ ተዘጋጅቷል፤ ነገር ግን ጉዳቱ ከፍተኛ ከሆነ ጥናቱን የሚያደርገው አካል ሙሉ ወጭዎን በመሸፈን ያሳክማል። በዚህ ጥናት እና ምርምር የሚሳተፉ ማንኛውም አካል የተለየ ጥቅም አያገኝም። የሰልጠና ጊዜው የሚይዘው ሰውነትን ማማሚቅ፣ ማሳሳብ፣ የተለያዩ የከፍታ ዝላይ፣ የቅልጠፍና እንቅስቃሴዎች እና ሰውነት ማቀዝቀዣ ናቸው።

4. ሚስጥራዊነት

ከእርሶ የምናገኘው መረጃ ከምንም እና ከማንም የተጠበቀ ነው። በመሆኑም ከእርሶ የሚገኘው መረጃ አንድ እና አንድ ለጥናቱ የሚያገለግል ይሆናል። በመሆኑም መረጃዎ የተጠበቀ ሲሆን መረጃዎ ሪፖርት ሲደረግ የግለሰብ ማንነትን አንጠቅስም።

5. መብት

በዚህ ጥናት እና ምርምር ለመሳተፍ የእርሶ ፍቃደኝነት ይጠየቃል። በማንኛውም ጊዜ ሥልጠናውን ሊያቆሙ ይችላሉ በመሆኑም ይህንን ሲያደርጉ ምንም ሉያጡ የሚችሉት ነገር የለም።

6. መገኛ አድራሻ

ምንአልባት ምንም አይነት ጥያቄ በጥናቱ ሊይ ቢኖርዎት እባክዎን በማንኛውም ሰአት በሚከተለው አድራሻ ያግኙን፤ Asegedech Bassa (+251913211790 ወይም), asegedechbassa@g-mail.com በተጨማሪም ምንም አይነት ችግር እና ቅሬታ ካሉት ወላይታ ሶዶ ዩንቨርሲቲ ስፖርት ሳይንስ ትምህርት ክፍል ሉያቀርቡ ይችላሉ።

7. የፍቃደኝነት መረጃ ሰጪ ስምምነት መግለጫ

የተቀመጡትን የተሳታፊ መረጃ መስጫ እና የጥናቱ ጠቀሜታ፣ ቅደምተከተል፣ ችግሮች እና ጥቅሞችና ሚስጥራዊነት፣ የተሳታፊዎችን መብት እና አድራሻ በተገቢው ሁኔታ ተረድቻለሁ። በተጨማሪም ከጥናቱ በፊት ወይም በጥናቱ ወቅት አቋርጬ የመውጣት መብት እንዳለኝ ተነግሮኛል። እንዲሁም ግላዊ መረጃዎቼ እንደሚጠበቁልኝ እምነት ተሰጥቶኛል። ስለሆነም በጥናቱ ሂደትም ሆነ በጥናቱ ለመመዘን ፍቃደኛ ነኝ በመሆኑም ፍቃደኝነቴን በማረጋገጥ መረጃ ለመስጠት ተስማምቻለሁ።

የተሳታፊ ፊስም:-----

መረጃያሰባሰበው አካል ስም:- አሰገደች ባሣ

ቀን:-----

ፊርማ:-----

ቀን:-----

ፊርማ:-----