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Identifying Differences Between Basketball, Handball and Volleyball Players

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Annotation: This study investigated the impact of specific training on the explosive force and agility of players during the preparatory phase of basketball, handball and volleyball. Aim. The purpose of this study was to notice the differences between sports and improvements during the preparatory phase and in the future to serve the coaches in preparing better sport specific programs.

Keywords: explosive force, agility training, team sports, hexagon agility test; jumping, physical training.

Introduction History of Handball Evidence shows that a version of handball was played in ancient Greece as a sport and recreational activity. The aim was to pass the ball and prevent opposing team members from getting hold of the ball. A version called "Expulsim Ludere" is believed to be a handball for ancient roman women. Although there isn't in-depth documentation showing handball's evolution over the years, there are records showing handball versions in France, Denmark, Czech, Ukraine, and Germany in the early 19th century. Modern handball rules were written in 1906 by a Danish gym teacher. They were first published on 29 October 1917 by Erich Konigh, Karl Schelenz, and max Heiser in Berlin. The rules are the basis for modern handball, and they were used in the first handball match in 1917 in Berlin. Karl Schelenz improved on the rules in 1919. The first international game was a men's match in 1925 between Germany and Austria. The women's teams from both countries faced each other in 1930. The Congress for International Amateur Athletics Federations made a committee to create international rules. In 1928, a governing body known as the International Amateur Handball Association was founded. In 1946, the International Handball Federation was formed. Men's handball teams first played in the Summer Olympics in 1936 and later in 1972. Women's teams first played in Summer Olympics in 1976 in Montreal. Between 1938 and 1995, men's world championships were held every 2-3 years. Women's world championships were first held in 1957. Since 1995, world championship competitions are held every two years in odd numbers. Rules Many rules govern handball as a sport. The rules define the teams' size, play the game, scoring points, and offense. Rules aim to keep the game honest and prevent injuries to players during the game. DURATION: A match has 30-minute halves that are separated by a 10-15 minute break. Major games and Olympics give 15 minutes for halftime. The halves are 25 minutes each for youths 12-15 years and 20 minutes for those 8-11 years. The guidelines may differ from one national federation to the next. Teams switch side after halftime, and matches that end in draws get a maximum of two 5-minute overtime periods. That continues until one team wins. PLAYING RULES: Players can touch the ball with any body part from the knee upwards, including the knee. The ball passes between players to prevent opponents from taking possession of the ball until a score is made at the goal. Players must dribble when running the ball a maximum of three times or hold the ball a maximum of three seconds without dribbling. Therefore, the main moves are to pass, dribble, or shoot the ball to avoid breaking the rules. GOALKEEPER RULES: A goalkeeper can kick a ball within the goal area to gain terrain and pass the ball to a team member. Other players cannot let the ball touch their feet. Goalkeepers cannot go past the goal area with a ball in their hands. Any member of the team can

substitute a goalkeeper without having to wear identifying uniforms. Goalkeepers can join in the game as part of a strategy to increase a team's field players. However, they must adhere to the rules of regular players when outside of the goal area.

In individual sports and in team sports, physical preparation during the preparatory phase is important to achieve better results. Thus, a high importance is given to the choice of methodology, which in conjunction with realizing the technique, enables optimal specific movements. Unfortunately, in reality, physical preparation is treated separately from technical sports achievement. To have a better game, both in defense and attack it is absolutely necessary the permanent improvement of general and specific physical training hints. Physical training, the component of sports training, marks the entire training process, determines the performance of athletes, and the evolution trends of the game world-wide indicate even an increase in the importance of this factor [11, 29]. Team sports are very complex activities, and activities during the game can only be achieved by realizing a number of motor skills and anthropometric characteristics. The results achieved by a basketball, handball, or volleyball player during a game depend on different factors that affect the player's efficiency [50]. According to a previous publication by the authors, all factors cannot have an equal effect on the result, and they cannot be analyzed individually without adequate reliance upon other factors. One factor does not have the same coefficient of correlation as other factors [27]. Since there are many sports, there is a big variety of anthropometric abilities and characteristics. It is important to have detailed knowledge of the movements required, training equipment, and methods and loads required and their effects on Introduction. This study investigated the impact of specific training on the explosive force and agility of players during the preparatory phase of basketball, handball and volleyball. Aim. The purpose of this study was to notice the differences between sports and improvements during the preparatory phase and in the future to serve the coaches in preparing better sport specific programs. Materials and Methods. The research sample was chosen among students of the University of Prishtina Faculty of PES. The sample was split in three groups. The first group was composed of 15 students who were active basketball players in different Super league teams. The second group was composed of 15 students who were active handball players while the third group was composed of 15 students who were active volleyball players. Seven different motor tests were used to determine the explosive force and agility: Leonardo Jumping Test, the Long Jump, the Seated Medicine Ball Throw, the 20-Meter Speed Test, the Agility T-Test, the Illinois Agility Test and the Hexagon Agility Test. LEJUTE were applied using Leonardo Mechanography GRFP STD. Results. The variable analysis showed that the training programs for basketball, volleyball, and handball increased the explosive force and agility of the players. The process of increasing agility occurs when explosive force and speed are developed as a precondition for improving balance and coordination. Conclusions. We can conclude that due to the higher priority and importance given in the preparatory phase from basketball clubs to agility and explosive force training, the students engaged in professional basketball clubs have shown better results overall. Agility is an important component of physical training in team sports games, conditioning the physical performance of athletes [32, 33, 39]. Agility targets changing the direction of body movement or the execution of movements in relation to an external style involving the athlete a good ability to anticipate and decision-making tasks [35, 37, 44, 49]. Explosive force is the human ability to develop and increase strength as quickly as possible during rapid voluntary muscular contractions [7, 14, 21], being dependent on the age of the subjects [3, 43, 51], and on the functional interdependence of the muscle groups [13, 48]. The explosive force conditions the jumps and the technical actions of finishing, of scoring, specific to the sports games. Speed, agility and quickness training (SAQ training) integrates basic and specific situational training as developed in the field. This method of training uses eccentric-concentric contractions, which are much more efficient and make the athlete

stronger than only using concentric contractions motor abilities [5]. The development of motor skills, perfection of these abilities, and the specific skills practiced during the preparatory phase are important aspects that can have effect during a physical preparation program [18]. The technical-tactical demands of many sports disciplines, such as basketball, handball volleyball, often include practices that require changes in the frontal sagittal field of the brain, e. g., different types or unique jumps are required for each specific type of sport [34]. These different demands require adequate preparation and a high amount of physical preparation regarding the technical, tactical, basic, and specific motor because, e. g., many different jumping techniques exist depending on the type of sport [52]. Previous authors and studies have found a similar need for deliberate HR training in other sports, but this is demonstrated here for the first time in elite handball players. It is recommended that handball coaches implement inseason HR training to enhance the performance of their players. Potential neuromuscular explanations of the observed gains merit further investigation [15]. The maximal rate of rise in muscle force [rate of force development (RFD)] has important functional consequences as it determines the force that can be generated in the early phase of muscle contraction 0–200 ms [1]. Aerobic and anerobic of young basketball players can be significantly improved during the off-season using only specialized basketball training performed exclusively on the court [4]. It is well known that traditional RT programs can produce desirable results such as improved muscular strength and local muscular endurance [24]. Maximal rate of oxygen uptake is one of the most commonly measured parameters in basic and physiological sciences and it is frequently used to indicate the cardio-respiratory fitness of an individual [17]. Explosive strength and agility are two components of major importance in optimizing the physical and technical potential of athletes playing team sports games. Basketball, handball and volleyball require players to perform technical procedures in conditions of efficiency and adversity in which strength, coordination and agility are essential components for increasing efficiency and sports performance. [9, 10, 19, 36]. In the study, we expected that physical training in elite players would not show significant differences in terms of explosive force and agility. If differences are found, we want to identify which team sports games has the greatest impact in terms of physical training, in the development of explicit strength and agility and implicitly on sports performance. We consider that the identification of these aspects of physical training will determine the optimization of the sports training process. This study investigated the impact of specific training on the explosive force and agility of players during the preparatory phase of basketball, handball and volleyball. The purpose of this study was to notice the differences between sports and improvements during the preparatory phase and in the future to serve the coaches in preparing better sports specific programs. Materials and Methods Participants The research sample was chosen from students of the University of Prishtina Faculty of Physical Education and Sports that were in undergraduate years I, II, III, and IV and in master's degree years I and II. The sample was split in three groups. The first group was composed of 15 students who were active basketball players in eight different Super league teams during the 2017/18 sports season. The second group was composed of 15 students who were all active handball players in eight different handball Super league teams during the 2017/18 season. The third group included 15 students who were active volleyball players in eight volleyball Super league teams during the 2017/18 season. Inclusion criteria: active athletes, active students, completion of the training program, male, age 18–35. In total, 45 athletes participated, and all the athletes consented to participation in this study as voluntaries. The research was conducted in accordance with the ethics rules and the research standards of the Declaration of Helsinki (1964) and its amendments. All authors contributed equally to this article. Research Design The research was conducted after the end of the preparatory training phase for sports teams, which lasted 45 days. Specifically, the changes in the explosive force and agility were measured on the 24th, 25th, and 26th of February in the Sports Hall in the Physical Education and Sports Faculty of University of Prishtina. Seven motor tests were used to determine the explosive force and agility: the Leonardo

Jumping Test (LEJUTE) (Jump for maximum height), the Long Jump (LONJUM), the Seated Medicine Ball Throw (SMEBTH), the 20-Meter Speed Test (MSPT20), the Agility T-Test (AGTTES), the Illinois Agility Test (ILAGTE) and the Hexagon Agility Test (HEAGTE). LEJUTE was applied using Leonardo Mechanography GRFP STD. Leonardo Mechanography measures the dynamic ground reaction forces and calculates the center of mass related physical parameters, including acceleration, velocity, energy, power, jumping height and stiffness or flexibility. The LONJUM test was performed without shoes from a hard platform to a karate mattress, where the distance was measured in cm. The SMEBTH test was performed by throwing a 3-kg medicine ball from a seated position in a chair. The MSPT20, AGTTES and ILAGTE were measured using a photocells system (Brower Timing Systems). The HEAGTE was conducted using a chronometer. Statistical Analysis The results from the measurements were processed via basic statistical analysis using the following parameters: minimal result (Min), maximal result (Max), arithmetic average (X), standard deviation (SD), the Skewness measure of symmetry, and Kurtosis. Measure if data is heavy-tailed or light-tailed compared to a normal distribution is measured with Kurtosis. To determine the difference between the means of the three independent groups, ANOVA analysis, and PostHoc, Least Significant Difference LSD test were used. The statistically significant choice for the study was $p < 0.05$. 3. Results Table 1 shows the basic statistical parameters for 15 basketball players. For the LEJUTE, the results have a symmetric spread, and the mean leans towards the lower results (hypokurtic). Additionally, most of the results are higher, and the kurtosis curve is platykurtic. For the LONJUM test, the results have a symmetric spread, and the mean leans towards the lower results (hypokurtic); additionally, most of the results are higher, and the kurtosis curve is platykurtic. For the SMEBTH test, the results have a symmetric spread and the mean leans towards the high results (leptokurtic); additionally, most of the results are lower, and the Kurtosis curve is platykurtic. For the MSPT20, the results have a symmetric spread, and the mean leans towards the lower results (hypokurtic); additionally, most of the results are higher and the kurtosis curve is mesokurtic. For the AGTTES, the results have a symmetric spread, and the mean leans towards the low results (hypokurtic); additionally, most of the results are higher and the Kurtosis curve is mesokurtic. Discussion It is known that sports results that are achieved by elite athletes depend primarily on motor skills. For this reason, quantitative changes that are achieved in sports are due to training programs that are specific to the sport. Based on the results of this study we conclude that due to the higher priority and importance given in the preparatory phase from basketball clubs to agility and explosive force training, the students engaged in professional basketball clubs have shown better results overall. In team sports such as handball [12, 36], the fitness of components such as speed and explosive force is of particular importance. A wellplanned program combining athletic training with fitness as well as adding agility training leads to improved physical and functional parameters in athletes with regard to basketball players [46]. These well-planned programs, including physical parameters such as strength and power, reduce the risk of trauma to athletes. A study at University of Alicante also came to an interesting conclusion that there were very slight differences in the level of agility among the players in the four different sport games [45].There is no consensus in the scientific literature on the use of a single battery of tests to assess fitness in team sports, our proposal seems valid finding significant differences between three different disciplines [38]. The variable analysis showed that the training programs for basketball, volleyball, and handball increased the explosive force and agility of the players. This increase was more noticeable for basketball players. The process of increasing agility occurs when explosive force and speed are developed as a precondition for improving balance and Agility is primarily determined by good knowledge of motor movements or a high level of motor skill. Agility is a crucial factor of a players in taking a fast, precise and accurate decision [2]. In the chain of movement, a wrong motor movement anywhere along the movement chain often disables proper execution of the move overall or upcoming moves. For these reasons, agility must be practiced

daily and during the whole season to provoke instinctive reaction. Scheduling agility, explosive force and speed training includes "splitting" these into smaller components and processing the components in zones that are isolated from the game itself. Training for these different abilities occurs via communication with the brain in a similar manner, the same energy sources, and common factors that depend on the individual ability levels [26]. Developing these skills enables fast work and explosive movement, and it is believed that renowned athletes that have the skill of explosive reaction have easier control of their bodies under extreme conditions during competitions. Although the players showed improvements in physical parameters we are very aware that this data should be looked at in a different perspective including a control and intervention group. It can also be noted as a weak point of this study the low number of participants in this study. This study also includes many direct tests that give this study an advantage. In their study [47] studied the effects of exercise training on agility performance in athletes. The results of this study showed that in order to improve muscular strength and athletic performance, good exercise planning is needed through complex agility exercises. The authors also suggest that this exercise be combined with plyometric and strength training. We suggest in the future a study of a mix training method aiming training physical components including strength, speed, cardiorespiratory fitness and power. Also the data obtained from this study will be viewed and applied only to men and not for women (seeing that only male gender is included in the study). The development of speed and agility is directly linked to nervous system factors and mechanisms of transmission of nerve impulses for neuronal cells and functional structures, the terms in the system and processes neuromuscular stimulation should note to make plans and training programs for the development of these capabilities [30]. Influential biomotor capacity an exercise to the components you want to upgrade cannot be separated from the implementation plan and exercise program is good, true, and using a scientific approach. High Intensity Interval Training (HIIT) workout is prepared using a scientific approach and implemented very seriously. High Intensity Interval Training (HIIT) effects on the increasing Explosive Power, Speed, and Agility [8, 28, 42]. The results of our study are closer to those of previous research which have highlighted the importance of explosive force and agility in optimizing physical training and implicitly in obtaining sports performance, but which have been mainly focused on different others team sports [20, 31, 40], and track and field [6, 22, 23, 25, 41]. But, the results of our study show comparatively how the explosive force and agility show significant differences between three team sports games in the context of a relatively unitary physical training. Strengths and limits. A major strength point is the complexity of the information in the comparative study analyzed on the impact of explosive force and agility in three team sports. The results of the study allowed us to identify the highest level of explosive force and agility of basketball players against volleyball and handball. Highlighting the weight that explosive force and agility have in the physical training process with an impact on the efficiency of technical training and sports performance. Among the limits of the study we can highlight: the relatively small number of participants for each team sports game; analysis only of certain parameters of physical training, namely explosive force and agility; limited duration focused on the period of physical training; non-analysis of the impact of the analyzed physical parameters on the technical performances within the sports competitions. Conclusions As in every sport, the training plans for basketball, handball and volleyball during the preparatory phase are basic documents that describe the process of sports preparation, their realization and the results of the preparation. The training process and preparation of athletes is optimized so that during practice and games athletes do not suffer from chaotic injuries. The preparation can be successfully managed and regulated if there are a clear set of objectives, duties, cycles and time restrictions; however, even if these are clearly set, the loads, working methods, locations and training equipment used may be different. The obtained results show that during the preparatory phase in training sessions basketball coaches focus heavily on explosive force and agility development. In basketball, handball and volleyball, only selected drills in the practice

session, a good intensity, and extensive practice schedules that result in tiredness during the sessions will lead to optimal preparation and development of important anthropometric skills that will result in top achievements.

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