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Exploring the relationship between weight training and motor fitness components in college Handball Players

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Abstract

The research aimed to scrutinize the impact of weight training on the nuanced development of motor fitness components, encompassing speed, agility, flexibility, explosive power, cardiovascular endurance, and muscular endurance. A cohort of 120 students enrolled in diverse colleges within the Meerut district, affiliated with Chaudhary Charan Singh University, Meerut, Uttar Pradesh, served as the subjects for this investigation. Specifically selected from the realm of Handball players, where these motor fitness components assume paramount significance, the average age of the participants was 21 years, spanning an age range from 18 to 28 years.

The study employed a meticulous methodology by segregating the participants into two distinct groups - the Control Group and the Experimental Group, each comprising 60 subjects, selected through a random sampling technique. The Experimental Group embarked on an intensive 12-week training regimen encompassing both weight training and skill development sessions, whereas the Control Group adhered to their routine activities without the prescribed interventions.

Data collection occurred at the commencement and culmination of the 12-week experimental period, demarcating pre- and post-tests. Through this comprehensive approach, the research sought to unravel the intricate interplay between weight training and the multifaceted dimensions of motor fitness in the context of Handball players. The investigation not only contributes to the scientific understanding of the subject matter but also holds potential implications for refining training protocols and optimizing athletic performance within the realm of collegiate Handball.

Keywords: Agility, Cardiovascular, Endurance and muscular endurance, Explosive power, Flexibility, Motor fitness components, Speed, Weight training

Introduction

Handball is a team sport in which two teams of seven players each (six outfield players and a goalkeeper) pass a ball to throw it into the goal of the other team. A standard match consists of two periods of 30 minutes, and the team with the most goals scored wins.

Handball, a fast-paced and dynamic team sport, is played between two teams of seven players each, striving to score goals by throwing a small ball into the opponent's net. This globally popular game demands a combination of athleticism, strategy, and teamwork, making it an exhilarating spectacle for both players and spectators alike.

The playing field is typically rectangular, divided into two halves, with goals at either end. The goals are similar to those used in soccer but are larger, and the objective is to propel the ball past the opposing team's goalkeeper and into the net. Players move the ball by passing, dribbling, and executing well-timed throws, fostering a fluid and strategic style of play.

Handball is characterized by its high-scoring nature, with rapid transitions between offense and defense. The game requires a blend of physical prowess, including speed, agility, strength, and endurance, as well as refined hand-eye coordination and quick decision-making. The physical demands of the sport are evident in the continuous back-and-forth nature of the game, keeping players constantly engaged and challenged.

Teamwork is paramount in handball, as players coordinate their movements to create openings for attacks and to defend against the opponent's advances. The fast-paced nature of the game often leads to close and intense matches, keeping spectators on the edge of their seats.

Handball enjoys widespread popularity, particularly in Europe, where it has a strong tradition and is a major sport. It has also gained traction in other parts of the world, with international

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competitions and leagues contributing to its global appeal. The sport is governed by the International Handball Federation (IHF), which oversees the rules and regulations, organizes major tournaments, and promotes the development of the sport worldwide.

At the competitive level, handball is contested in various formats, including indoor and beach handball. The sport has a rich history in the Olympic Games, having been part of the official program since 1972 for men and 1976 for women. Olympic handball competitions showcase the highest level of skill and athleticism, with teams from different countries vying for the prestigious gold medal.

In essence, handball stands as a thrilling and physically demanding team sport, blending strategy, skill, and teamwork into a captivating and dynamic spectacle enjoyed by millions around the globe.

Modern handball is usually played indoors, but outdoor variants exist in the forms of field handball and Czech handball (which were more common in the past) and beach handball (also called sandball).

The game is quite fast and includes body contact as the defenders try to stop the attackers from approaching the goal. Contact is only allowed when the defensive player is completely in front of the offensive player, i.e. between the offensive player and the goal. This is referred to as a player sandwich. Any contact from the side or especially from behind is considered dangerous and is usually met with penalties. When a defender successfully stops an attacking player, the play is stopped and restarted by the attacking team from the spot of the infraction or on the nine meter line. Unlike in basketball where players are allowed to commit only 5 fouls in a game (6 in the NBA), handball players are allowed an unlimited number of "faults", which are considered good defence and disruptive to the attacking team's rhythm.

Goals are scored quite frequently; usually both teams score at least 20 goals each, and it is not uncommon for both teams to score more than 30 goals. This was not true in the earliest history of the game, when the scores were more akin to that of ice hockey [clarification needed]. But, as offensive play has improved since the late 1980s, particularly the use of counterattacks (fast breaks) after a failed attack from the other team, goal scoring has increased.

Origins and Development

There are records of handball-like games in medieval France, and among the Inuit in Greenland, in the Middle Ages. By the 19th century, there existed similar games of håndbold from Denmark, házená in the Czech Republic, hádzaná in Slovakia, gandbol in Ukraine, torball in Germany, as well as versions in Uruguay.

The team handball game of today was formed by the end of the 19th century in northern Europe, primarily Denmark, Germany, Norway and Sweden. The first written set of team handball rules was published in 1906 by the Danish gym teacher, lieutenant and Olympic medalist Holger Nielsen from Ordrup grammar school north of Copenhagen. The modern set of rules was published on 29 October 1917 by Max Heiser, Karl Schelenz, and Erich Konigh from Germany. After 1919 these rules were improved by Karl Schelenz. The first international games were played under these rules, between Germany and Belgium for men in 1925 and between Germany and Austria for women in 1930.

Therefore modern handball is generally seen as a game of German origins.

In 1926, the Congress of the International Amateur Athletics Federation nominated a committee to draw up international rules for field handball. The International Amateur Handball Federation was formed in 1928, and the International Handball Federation was formed in 1946.

Men's field handball was played at the 1936 Summer Olympics in Berlin. During the next several decades, indoor handball flourished and evolved in the Scandinavian countries. The sport re-emerged onto the world stage as team handball for the 1972 Summer Olympics in Munich. Women's team handball was added at the 1976 Summer Olympics. Due to its popularity in the region, the Eastern European countries that refined the event became the dominant force in the sport when it was reintroduced.

The International Handball Federation organized the men's world championship in 1938 and every 4 (sometimes 3) years from World War II to 1995. Since the 1995 world championship in Iceland, the competition has been every two years. The women's world championship has been played since 1957. The IHF also organizes women's and men's junior world championships. By July 2009, the IHF listed 166 member federations - approximately 795,000 teams and 19 million players.

Gameplay

Formations

Players are typically referred to by the position they are playing. The positions are always denoted from the view of the respective goalkeeper, so that a defender on the right opposes an attacker on the left. However, not all of the following positions may be occupied depending on the formation or potential suspensions.

Offense

- Left and right wingman. These typically excel at ball control and wide jumps from the outside of the goal perimeter to get into a better shooting angle at the goal. Teams usually try to occupy the left position with a right-handed player and vice versa.
- Left and right backcourt. Goal attempts by these players are typically made by jumping high and shooting over the defenders. Thus, it is usually advantageous to have tall players for these positions.
- Center backcourt. A player with experience is preferred on this position who acts as playmaker and the handball equivalent of a basketball point guard.
- Pivot (left and right, if applicable). This player tends to intermingle with the defense, setting picks and attempting to disrupt the defense formation. This positions requires the least jumping skills but ball control and physical strength are an advantage.

Defense

- Far left and far right. The opponents of the wingmen.
- Half left and half right. The opponents of the left and right backcourts.
- Back center (left and right). Opponent of the pivot.
- Front center. Opponent of the center backcourt, may also be set against another specific backcourt player.

Offensive Play

Attacks are played with all field players on the side of the defenders. Depending on the speed of the attack, one distinguishes between three attack waves with a decreasing chance of success:

First Wave

First wave attacks are characterized by the absence of defending players around their goal perimeter. The chance of success is very high, as the throwing player is unhindered in his scoring attempt. Such attacks typically occur after an intercepted pass or a steal and if the defending team can switch fast to offense. The far left/far right will usually try to run the attack as they are not as tightly bound in the defense. On a turnover, they immediately sprint forward and receive the ball halfway to the other goal. Thus, these positions are commonly held by quick players.

Second Wave

If the first wave is not successful and some defending players gained their positions around the zone, the second wave comes into play: The remaining players advance with quick passes to locally outnumber the retreating defenders. If one player manages to step up to the perimeter or catches the ball at this spot he becomes unstoppable by legal defensive means. From this position the chance of success is naturally very high. Second wave attacks became much more important with the "fast throw-off" rule.

Third Wave

The time during which the second wave may be successful is very short, as then the defenders closed the gaps around the zone. In the third wave, the attackers use standardized attack patterns usually involving crossing and passing between the back court players who either try to pass the ball through a gap to their pivot, take a jumping shot from the backcourt at the goal, or lure the defense away from a wingman.

The third wave evolves into the normal offensive play when all defenders reach not only the zone but gain their accustomed positions. Some teams then substitute specialized offense players. However, this implies that these players must play in the defense should the opposing team be able to switch quickly to offense. The latter is another benefit for fast playing teams.

If the attacking team does not make sufficient progress (eventually releasing a shot on goal), the referees can call passive play (since about 1995, the referee gives a passive warning some time before the actual call by holding one hand up in the air, signaling that the attacking team should release a shot soon), turning control over to the other team. A shot on goal or an infringement leading to a yellow card or two minute penalty will mark the start of a new attack, causing the hand to be taken down, but a shot blocked by the defense or a normal free throw will not. If it were not for this rule, it would be easy for an attacking team to stall the game indefinitely, as it is difficult to intercept a pass without at the same time conceding dangerous openings towards the goal.

Defensive Play

The usual formations of the defense are 6-0, when all the defense players line up between the 6 meter and 9 meter lines to form a wall; the 5-1, when one of the players cruises

outside the 9 meter perimeter, usually targeting the center forwards while the other 5 line up on the six meter line; and the lesser common 4-2 when there are two such defenders out front. Very fast teams will also try a 3-3 formation which is close to a switching man-to-man style. The formations vary greatly from country to country and reflect each country's style of play. 6-0 is sometimes known as "flat defense", and all other formations are usually called "offensive defense".

Organization

Handball teams are usually organized as clubs. On a national level, the clubs are associated in federations which organize matches in leagues and tournaments.

International Bodies

The administrative and controlling body for international Handball is the International Handball Federation (IHF). The federation organizes world championships, separate for men and women, held in uneven years. The final round is hosted in one of its member states. Current title holders are France (men) and Russia (women).

The IHF is composed of five continental federations which organize continental championships held every other second year. In addition to these competitions between national teams, the federations arrange international tournaments between club teams.

Handball is a no-contact game, played either out of doors or indoors. It is played but 2 opposing teams. There are 12 players in one team. 10 of them are court players and 2 are goal keepers. But at one time players not more than 7 do not enter the court. 6 of them are court players and 1 is goal keeper. The remaining 5 are substitutes. A player may be included in a game or a substitute may be allowed for him. There shall be none in the goal area except the goal keeper.

A field anything from 80-150 yds by 45 to 100 yds with goal-circles of 10 yds radius, a penalty spot 14 yds infield from the middle of each goal, goal posts 8 yds. apart and 8 ft. high, a centre circle of 10 yds radius and an offside line 18 yds. inside and parallel to each goal-line. In the women's game the penalty spot is 13yd mark.

The playing field for field handball is similar to that of soccer, the indoor version requiring a much more limited playing area. A match is started from the centre point, the ball being passed with short or long throws from one player of a team to other and in this way attacks are built up which culminate in attempts at scoring.

The game of handball is not very old. Although handball has been played in different forms and under different names having some similarity of the game like 'HAZANA', 'TORBALL' and 'HANBOLD' and others. Present handball as having played in of olympics is small court handball i.e. a side a short court.

It is believed that this game originated from Germany. Hazana on the other side is game from Czeckslovakia which is still played there which has many similarities of Handball. The first formal rules were given by Prof. Vaclav Karas in 1905. 'Handball' which has also alike qualities a handball was introduced by Professor Holger Nielsen in 1898. In 1907 another Nielson elaborated the rules and organised competitions and recommended the formation of Federation. In 1915 Max Heiden Combined some games and named a indoor during the winter months although the ball was quite behaviour and without bladder. In 1919 professor Karl

Schelez of Berlin named a game 'Handbold' which was similar to soccer with 11 players at each side. The ball having used was a volley or soccer ball. This game bought up and become very popular till 7 a side handball was introduced. The first international competition for men and women was held in the year 1925 and 1930 in Vienna Austria respectively.

In the beginning being running oriented game it came under the international Amateur Athletic Federation (I.A.A.F.) and organised many minor sports in Europe at that time. In 1926 I.A.A.F. appointed a special committee representing the countries where Handball was played to set up standard rules for this game. International Amateur Handball Federation is the ruling body throughout the world.

Team handball is played by three million athletes in over 50 countries. In Europe, it is second in popularity only to soccer, while in the United States it is rapidly gaining popularity due to its exciting brand of continuous action play. The ancestry of modern team handball can be traced back more than 3000 years to ancient Greece. In the Odyssey, Homer described a handball game called urania. Shortly after the time of Christ, the Roman Physician Claudius Galenus described harpastons, and during the Middle Ages, a third ancestral handball game named fangball was recorded by Walter von der Vogelweide. Each of these were played in an open field or courtyard, and were similar to team handball.

The modern game can be played outdoors on an open field very similar to that used for basketball. Net goals are located at each end of the court or field, and are constructed like smaller versions of soccer goals. A leather covered ball seven inches in diameter is the other piece of equipment.

In international meets, team handball play is continuous for two 30-minute halves, punctuated by a 10 minute rest period. Teams defending their own goal. The ball can be advanced an unlimited distance by dribbling it like a basketball, but once a dribble has been interrupted, only three steps can be taken. If a player stops his movement down the field, he must pass the ball within three seconds. Body contact is permitted, so that the game occasionally be very punishing.

The rudiments of team handball can be learned both quickly and easily, but mastery of the game takes years. This is due to the myriad small nuances of team strategy and play. The ball, for example, is usually played with the hands, but it can be touched or played with any part of the body above and including the knees. Only the goal keeper can touch the ball with all parts of his body in an attempt to defend his net. In addition to the stamina necessary for an hour of virtual non-stop running, several physical qualities are necessary for handball excellence. Running speed, agility, fast reaction time and dexterity are essential for success. These qualities are enhanced by doing gymnastics, running and throwing in each workout, as well as ball handling and strategy.

Team handball on the international level can be an elegant statement team sports and the value of team work. It is easily equivalent to a championship basketball or soccer game. As a result team handball is now permanently included on the Olympic Games program.

In the beginning, last European countries like Romania, Czechoslovakia, Yugoslavia, Hungary and Germany had lot of success. As the game developed other countries like United States, Canada, Japan, Great Britain, and Turisia took part in various International competitions and attained success before the game was introduced in the olympics.

Handball came to India in year 1971. The first national eleven-a-side Handball championship held at Rohtak (Haryana). Seven-a-side Handball started in India in 1976 following the least rules of the game. India toured China in 1979 and Germany in 1982. Indian team participated in the Asian Games in 1982. At present India is an upcoming country in Handball and had been participating in the International competitions regularly. Indian Handball Federation is organising the nationals in juniors and seniors for both man and woman.

Statement of the Problem

The objective of this research endeavor was to ascertain the impact of weight training on the motor fitness components and skill performance variables among collegiate Handball players. The formulated hypotheses were as follows:

It was hypothesized that there would be a substantial difference in the effect on motor fitness components variables following a 12-week weight training regimen within the Experimental Group.

Conversely, the second hypothesis posited that there would be no significant difference in the effect on motor fitness components variables after the same 12-week weight training period within the Control Group.

Review of the Related Literature

In a comprehensive study conducted by Rahaman Rahimi and colleagues in 2005, an investigation was undertaken to discern the impact of diverse training protocols, specifically plyometric, weight, and the combination of plyometric-weight training, on anaerobic power and muscular strength. The study meticulously examined the effects of three distinct training regimens—plyometric training, weight training, and their amalgamation—on variables such as vertical jump performance, anaerobic power, and muscular strength.

To execute the study, 48 male college students were selectively grouped into four distinct categories ($n = 14$ each), with an additional Control Group ($n = 4$). Measurements of vertical jump height, 50-yard sprint times, and maximal leg strength were diligently recorded both prior to and following a rigorous 6-week training period. The participants in each training group adhered to a structured regimen of two sessions per week, while the Control Group abstained from partaking in any form of training activity. The amassed data, comprising 68 sets of measurements, underwent rigorous analysis utilizing a one-way analysis of variance with a repeated measure design.

The outcomes of the investigation were striking, revealing that all three training modalities induced a statistically significant ($P < 0.05$) enhancement across the entire spectrum of variables assessed. This empirical evidence underscores the efficacy of the implemented training treatments in fostering notable improvements in anaerobic power and muscular strength among the study participants.

Methodology

The procedural framework, meticulously crafted for this study, encompasses various facets ranging from subject selection, variable determination, criteria for measurement, data reliability considerations, the actual execution of the experiment within the Experimental Group, to the meticulous application of the statistical techniques employed for data analysis.

This particular investigation was specifically tailored for individuals falling within the 18–28 years age bracket. A cohort of 120 male college Handball players will be judiciously chosen from the Meerut district. These players will be subjected to a random allocation process, resulting in the formation of two distinct groups: the Experimental Group and the Control Group.

The Experimental Group will actively participate in a structured weight training program designed to enhance their physical capabilities. In contrast, the Control Group will remain devoid of any organized physical activity throughout the duration of the study.

To assess the impact of the intervention, comprehensive pre- and post-tests will be conducted, meticulously evaluating various motor ability variables including speed, agility, flexibility, explosive power (both in the legs and arms), cardiovascular endurance, and muscular endurance. This methodological approach ensures a thorough exploration of the effects of the weight training program on the selected variables, providing valuable insights into the overall impact on the participants' physical prowess.

Collection of Data

Data on the selected motor fitness components variables were collected as per the method described above, before the experimental period (pre-tests), and at the end of Experimental period of 12 weeks (posttest) effect data that were collected in the all variables for 12 weeks. During this period, the subjects were not allow to participate in any training program.

Results

The data were analyzed with reference to the objectives and hypotheses by applied different kinds of statistical tools in

analyzing and establishing the related variables using independent t-test for comparison of Control Group and Experiment Group, paired t-test was applied to compare the pre-test and post-test scores and analysis of covariance by considering between pre-test scores is as a covariate (ANCOVA) was performed to assess the differences between Control Group and Experiment Group. The one-way ANOVA was applied to see the significant difference between two groups with respect to their variations in pre-test scores for homogeneity.

From the results of the above Table 1, it can be seen that:

- No significant difference was observed between pre-test and post-test scores of motor fitness component of college Handball players in Control Group ($t = 1.6519$, $P > 0.05$) at significance level of 5%. Therefore, the null hypothesis is accepted and alternative hypothesis is rejected. It means that the pre-test (4.02 ± 0.42) and post-test (3.99 ± 0.39) scores of motor fitness component of college Handball players are similar in Control Group. In another words, the weight training program is not effective in Control Group
- A significant difference was observed between pre-test and post-test scores of motor fitness component of college Handball players in Experiment Group ($t = 14.1913$, $P < 0.05$) at significance level of 5%. Therefore, the null hypothesis is rejected and alternative hypothesis is accepted. It means that the pretest (4.04 ± 0.26) scores of motor fitness component of college Handball players are significantly higher as compared to post-test (3.68 ± 0.30) in experiment group. In another words, the weight training program is more effective in Experiment Group.

Table 1: Comparison between Pre-test and Post-test Scores of Motor Fitness Components of College Handball Players in Control and Experiment Group

Groups	Test	Mean	SD	Mean Diff.	SD Diff.	Paired <i>t</i>	<i>P</i> -Value
Control Group	Pre-test	4.02	0.42				
	Post-test	3.99	0.39	0.03	0.16	1.6519	0.1039
Experiment Group	Pre-test	4.04	0.26				
	Post-test	3.68	0.30	0.35	0.19	14.1913	0.0001*

* $P < 0.05$.

Discussion

The results of the study entreat that weight training is improvement motor fitness component such as speed, agility, flexibility, explosive power, cardiovascular endurance, and muscular endurance. This is because of the fact that systematic weight training program has been proved to be a very fruitful work that has ever been carried out so for there for its becomes imperative on the part of researcher to delve into more details by way of more research and studies at macro level.

Conclusion

On the basis of analysis of data within the limitations of present investigation. The pre- and post-test scores of motor- fitness components of college Handball players are similar in Control Group and significantly higher as compared to post-test in Experimental Group.

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