



CORRELATION OF ARM EXPLOSIVE STRENGTH WITH HANDBALL VELOCITY IN HANDBALL PLAYERS

¹ Mansi shah, ² Dr. Ujwal Yeole

¹Intern, ² Associate Professor

^{1,2} Tilak Maharashtra Vidyapeeth College of Physiotherapy, Pune, India

Corresponding Author: Dr. Ujwal Yeole

Abstract: Handball is a dynamic contact sport in which throwing is important skill and players improve their chance of scoring by throwing ball as fast as possible. This study has been undertaken to evaluate the correlation of arm explosive strength with handball velocity in handball players. Bench press test[1RM] is used to assess the strength of upper extremity and handball throw test is used to assess handball throwing velocity. In this study total 30 male and female handball players were included. The study concluded that there is positive correlation between arm explosive strength with handball velocity in handball players.

Key words: Arm throwing, Explosive strength, Bench press test [1RM], Handball throw test, Handball velocity.

Introduction:

Handball is outdoor game usually played on 40m×20m court between two teams of eleven players.⁹ it is a popular sport played at all from recreational to fully professional. The game's origins were in Scandinavia in the 19th century and it is played around 19 million people today and has been Olympic sports. various actions such as throws, passes, jumps, hits, blocks, pushes, runs, and dribbling make it a sport of intermittent high intensity.⁷

Team handball is characterized by fast pace defensive and offensive actions during game with the objective of the game which is also the key to success is to score goals. for shots on goal, the offensive players attempt to establish an optimal position for the throwing player by fast movements over short distances performing changes in direction, action against defensive players and passing the ball using different offensive tactics.⁴ for the successful short on goal in handball depends on throwing ability and ball velocity.¹⁰ Out of the various actions like running, jumping, sprinting, throwing, hitting, blocking, pushing, throwing ability is considered as most vital element. Different types of throws in handball are overarm throw, standing throws and three step running throw etc. Phases of throwing are wind up, wind up the stride, arm cocking early, late cocking, acceleration and the deceleration.² players improves their scoring chance by throwing the ball as fast as possible towards the goal. as faster the ball is thrown towards the goal, less time the goalkeeper and defender have to save shot. Over arm throwing is necessary in different sports like baseball, handball, volleyball, water polo.⁶ Various factors like Age, Gender, Muscular strength, Ball weight, and Ball size influence ball velocity.¹²

Handball is vigorous contact sport game that requires high intensity efforts in short period of time.¹³ Therefore it seems that basic anthropometric characteristics are important to technical and tactical skills, but elite performance demands strength and power in both upper and lower limbs.¹ Previous study have been reported positive and significant correlation between ball velocity and general anthropometric characteristics like body mass, players Height and their body mass index.⁸ arm throwing is a deciding element in handball game. Velocity of the ball, aim accuracy and shoulder joint stability are the factors that influence throwing effectiveness¹¹. Therefore, aim of this study to correlates the arm explosive strength with ball velocity.

Strength is defined as the ability to overcome resistance with high speed, explosive strength is a combination of strength and speed abilities, refers to rate of force development in minimal time. Explosive strength magnitude is a function of three factors: intermuscular coordination, intramuscular coordination, and force by which muscles react to the neurons.⁸ one repetition maximum 1RM test is recognized as standard for the evaluation of muscular strength. It is defined as maximum weight can be lifted once with correct lifting technique. 1 RM is used by athletic trainer, health and fitness professionals and rehabilitation specialist to quantify strength and assess strength imbalances.^{3,5}

Methodology and procedure:

No of participants – 30 players

Inclusion criteria: -

Age group – Between 15- 30 year

Both male and female players

Handball players playing since 1 year

Exclusion criteria: -

History of any injury in upper limb

Acute shoulder pain

Outcome measures: -

- 1) To identify the explosive strength of arm Bench press test(1RM) has been used.
- 2) To identify the handball throwing performance, Handball throw test has been used.

Procedure: -

Permission was taken from the concerned ethical committee. Various handball clubs were approached across Pune. The aim and methodology of research were explained to participants and consent form were been signed by every participant. Total number of participants were n=30. They were told to fill data collection sheet and a self -reported questionnaire which had simple question about Name, Age, Gender, Weight, Height, Years of experience etc. assessment of arm explosive strength was done by using Bench press test[1RM] and ball velocity by using handball throw test.

Result: -

Result no.01: physical characteristics and assessment of handball players.

Table no.01

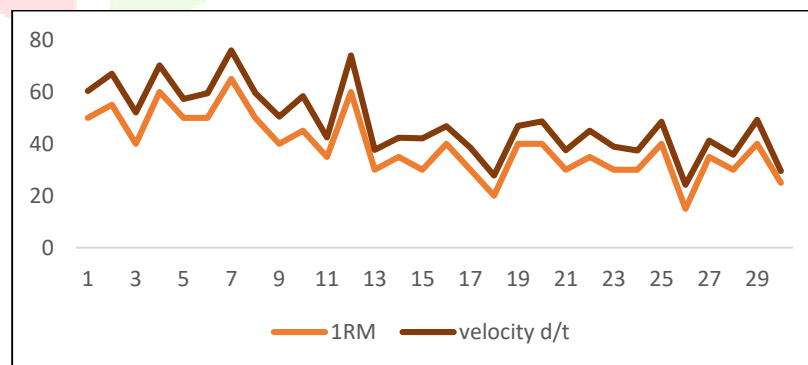
Distribution	Mean \pm SD
Age	18.06 \pm 0.92
BMI	22.16 \pm 2.54
Years of experience	3.2 \pm 1.01
Bench press test [1RM]	39.3 \pm 11.7
Handball velocity	0.91 \pm 2.21

Interpretation: Table no 1 shows Mean and SD of physical characteristics and assessment of players.

Result no.02: Correlation between Arm explosive Strength (1RM) and Velocity.

Table no.02

	Strength[1RM]	Velocity
Mean \pm SD	39.33 \pm 11.69	9.01 \pm 2.21
P- value	0.0001	
R -value	0.982	



Graph no 01: shows correlation of arm explosive strength with handball velocity.

Interpretation: As shown in graph 1, values of velocity and strength (1RM) are noted. The results shows that correlation coefficient ($r=0.9827$) and p value($p=0.0001$). The graph shows positive correlation between arm explosive strength and handball velocity.

Discussion

As the handball is a game, which required good level of different physical qualities and throwing ability is considered as important element. The key factor for winning the game is to shot on goal and that is also depends on ball velocity.

The study aim was to assess the correlation of arm explosive strength with handball velocity in handball players. Initially synopsis was approved by ethical committee and permission for data collection was taken from coaches of handball club Pune.30 handball players were selected according to inclusion and exclusion criteria. After that consent was taken. The outcomes measure for the study was Bench press test(1RM) and handball throw test which were performed.

In bench press test (1RM) procedure was explained and demonstrated to the players. And after the warmup participant was asked to lift the light to moderate weight and after a rest of two minutes participants again asked to lift the weight increased by 5-10%. participant who failed to lift that weight, the weight was decreased by 2.5-5%. And the values for 1RM were noted.

Handball throw test was assessed after the warmup. Participants were asked to throw 3 sets of 3 consecutive throw the throwing time was recorded by using stop watch and distance of throwing was measured by tape used for distance measuring. After measuring distance and time velocity was measured by using formula speed = distance/time (d/t).

Table no 1 shows mean and sd of physical characteristics and assessment of participants. Mean and sd of age of participants were 18.06 ± 0.92 . The mean and sd of BMI of participants were 22.16 ± 2.54 . The mean and sd of years of experience of participants were 3.2 ± 1.01 .

The mean and sd of Bench press test [1RM] of participants were 39.3 ± 11.7 . the mean and sd of handball velocity of participants were 0.91 ± 2.21 as shown in table no 1.

As shown in graph no 1. value of Bench press test and handball velocity are noted. Correlation coefficient value of bench press test and handball velocity are $r = 0.982$ and P value 0.0001 which shows that there is positive correlation between Arm explosive strength and handball velocity.

As graph 1 shows there is positive correlation between arm explosive strength and handball velocity. Hence there is a similar study which also conclude that throwing velocity of team handball players is related to their maximal dynamic strength, power, peak bar velocity.

Conclusion

The study concluded that there is positive correlation between the arm explosive strength and handball throwing velocity in handball players.

Acknowledgement

The success and result of this project required a lot of guidance and assistance, and I am extremely privileged to have got this all long the completion of my project.

I owe my deepest gratitude to my project guide Dr Ujwal Yeole (PT), who took keen interest on our project work and guided me along, till the completion by providing all the necessary information throughout numerous consultations. I will forever be grateful for the knowledge and skills that I have gained working under you. Thank you!

I respect and thank our principal who gave me the opportunity to do this wonderful project on the topic "Correlation of arm explosive strength with handball velocity in handball players."

I am thankful to and fortunate enough to get constant encouragement, support and guidance from all teaching staff of Department of Physiotherapy, which helped me in successfully completing my project work.

References

- 1) Hermassi S, Chelly MS, Fathloun M, Shephard RJ. The effect of heavy-vs. moderate-load training on the development of strength, power, and throwing ball velocity in male handball players. *The Journal of Strength & Conditioning Research*. 2010 Sep 1;24(9):2408-18.
- 2) Chelly MS, Hermassi S, Shephard RJ. Relationships between power and strength of the upper and lower limb muscles and throwing velocity in male handball players. *The Journal of Strength & Conditioning Research*. 2010 Jun 1;24(6):1480-7. Kim PS, Mayhew JL, Peterson DF.
- 3) A modified YMCA bench press test as a predictor of 1 repetition maximum bench press strength. *The Journal of Strength & Conditioning Research*. 2002 Aug 1;16(3):440-5.
- 4) Wagner H, Finkenzeller T, Würth S, Von Duvillard SP. Individual and team performance in team-handball: A review. *Journal of sports science & medicine*. 2014 Dec;13(4):808.
- 5) Grgic J, Lazinica B, Schoenfeld BJ, Pedisic Z. Test-retest reliability of the one-repetition maximum (1RM) strength assessment: a systematic review. *Sports Medicine-Open*. 2020 Dec;6(1):1-6.
- 6) Andrade MS, de Carvalho Koffes F, Benedito-Silva AA, da Silva AC, de Lira CA. Effect of fatigue caused by a simulated handball game on ball throwing velocity, shoulder muscle strength and balance ratio: a prospective study. *BMC Sports Science, Medicine and Rehabilitation*. 2016 Dec;8(1):1-7.
- 7) Saavedra JM. Handball research: State of the art. *Journal of human kinetics*. 2018 Aug 31; 63:5.
- 8) Bhupender Kumar, ² Dr. Amandeep Kaur, ³ Dr. Mandeep Thour. Conducted study on A comparative study of explosive leg strength and explosive arm strength between basketball and volleyball players.
- 9) Aguilar-Martinez D, Chiroso LJ, Martin I, Chiroso IJ, Cuadrado-Reyes J. The effect of strength training on throwing velocity in team handball. *Revista Internacional de Medicina y Ciencias de La Actividad Física y del Deporte*. 2012 Dec 1;12(48):729-44.
- 10) Zapartidis I, Skoufas D, Varelziz I, Christodoulidis T, Toganidis T, Kororos P. Factors influencing ball throwing velocity in young female handball players. *The Open Sports Medicine Journal*. 2009;3(1).
- 11) Fernandez-Fernandez J, Martinez-Martin I, Garcia-Tormo V, Garcia-Lopez J, Centeno-Esteban M, Pereira LA, Loturco I. Age differences in selected measures of physical fitness in young handball players. *Plosone*. 2020 Nov 12;15(11): e0242385.
- 12) Vila H, Ferragut C. Throwing speed in team handball: a systematic review. *International Journal of Performance Analysis in Sport*. 2019 Sep 3;19(5):724-36.
- 13) Raeder C, Fernandez-Fernandez J, Ferrauti A. Effects of six weeks of medicine ball training on throwing velocity, throwing precision, and isokinetic strength of shoulder rotators in female handball players. *The Journal of Strength & Conditioning Research*. 2015 Jul 1;29(7):1904-14.