



THE IMPACT OF AGILITY CIRCUIT TRAINING ON REACTION TIME AND AGILITY IN MEN KABADDI PLAYERS ON VARIED SURFACES

Dr. D. ABRAHAM SAMSON

Assistant Professor

Dr. Sivanthi Aditanar College of Physical Education, Tiruchendur, Tamil Nadu, India

Abstract: The purpose of this study is to evaluate the effects of Agility Circuit Training (ACT) on reaction time and agility in male Kabaddi players on different surfaces. Data were collected in Thoothukudi District, Tamil Nadu, India. Forty-five male Kabaddi players aged 18 to 23 were divided into three groups: two experimental groups (ACT Mud and ACT Mat) and one control group (CG). The subjects' reaction time was measured using the Ruler Drop Test in centimeters, while agility was assessed using a T-test, measured in seconds. The data for these groups were analyzed using Analysis of Covariance (ANCOVA). The results showed that male Kabaddi players experienced significant improvements in reaction time ($F(2,41) = 18.615, p = .000, \eta^2 = .464$) and agility ($F(2,41) = 12.502, p = .000, \eta^2 = .355$) after participating in ACT on different surfaces compared to the control group (CG) and among the experimental groups (ACT Mud and ACT Mat). Notably, the ACT Mud group exhibited moderate improvements in response time and agility when compared to the ACT Mat group.

Index Terms – Agility Circuit Training (ACT), Reaction Time, Agility, Varied Surface, ANCOVA

1. INTRODUCTION

Kabaddi, an ancient sport deeply rooted in Indian tradition, has transcended its cultural origins to become a globally recognized and fiercely competitive discipline. As the game gains prominence on the international stage, the demand for innovative training methodologies to elevate athletes' performance has never been greater. Kabaddi, characterized by its fast-paced and physically demanding nature, requires players to possess a unique blend of strength, agility, speed, and endurance. Traditional training methods are evolving to meet the demands of modern competition, with an increasing emphasis on scientific approaches that enhance overall athletic capabilities.

Motor fitness is a more comprehensive term which includes five motor performance components such as power, speed, agility, balance and reaction time, which are important mainly for success in sports [1]. In kabaddi players require motor, physical and physiological components for achieving their goal. Agility is the ability to change direction rapidly and accurately. The term “quickness” used interchangeably for both agility and change of direction and speed. Quickness has been identified as “a multi-planar or multidirectional skill that combines acceleration, explosiveness and reactive” this definition suggests that quickness consists of cognitive and physical reactive abilities and explosive acceleration [2]. Kabaddi players require agility in executing the movement in faster manner while riding and catching [1].

The surfaces on which athletes run on can play a vital role in determining how well they perform. So one of the important aspects in construction of sports surfaces is to improve athletic performance [3,4]. It has been documented that skill acquisition on different playing surface requires a lot of practice. There are different kinds of surfaces on which the subjects play sports, e.g. natural grass, asphalt and wooden parquet. Besides, synthetic surfaces for sport and recreational usage have been manufactured. It has been suggested

that the main feature of a sport surface that can affect the athletic performance is to storage and return energy. Stated that if some of the energy that an athlete requires for each step, stride, jump, landing, etc. can be reused, through energy return from the surface, the athlete can perform the same movement more efficiently. In other words, one can achieve a given physical activity by using less energy and, therefore, he continues his activity during a longer period.

The expertise in performing various game specific motor skills or basic fundamental skills is dependent upon properties of playing surface. Different surface properties have different effects on the dynamics and mechanics of movement. The properties of these surfaces influence sports performance. The hard surface is better for achieving the best results, although they are toughest on the body and increase the risk of injury. It produces high ground reaction forces which transmit shock through the body as the foot strikes the ground. In hard surface, maximum force, peak & mean pressure were higher for the heel region and higher frictional coefficient that enhanced the speed but induce more frequent injuries. Soft surfaces (PVC, soft clay & turf) are easy on impact and foot is able to roll more smoothly resulting in more balanced force and pressure values. Lower frictional coefficient leads to longer sliding movement or longer contact time on the soft surface. By investigating the impact of ACT on mud and mat surfaces, valuable insights can be gained to optimize training programs, and enhance performance. The findings will contribute to the existing knowledge of ACT's advantages in sports settings and benefit coaches, trainers, and athletes in making informed decisions about training methods and surface selection.

2. METHODS AND MATERIALS

Forty-five male Kabaddi players, ages ranging from 18 to 23, comprise the sample randomly selected from Thoothukudi district, Tamilnadu, India. The study was restricted to chosen variables such as agility and reaction time. The subjects' reaction time was determined using the Ruler Drop Test in centimeters [5]. To measure agility in seconds, a T-test is used in this study [6]. After being advised of the research protocols, each participant signed a written consent form to take part in the study. All participants received appropriate training about the study's purpose. The subjects were equally divided into three groups: Experimental Group 1 (ACT Mud Group), Experimental Group 2 (ACT Mat Group), and the Control Group. The time assigned to groups was the same, the experimental groups underwent ACT on Mud and Mat respectively, and the control group underwent only routine training. The training period for this study is 3 days per week, for a total of 12 weeks of ACT training. Prior to the test, each participant received the appropriate orientation from the investigator, which inspired them to put up their best effort when demonstrating reaction time and agility. Pre and Post tests were conducted before and after the 12 weeks of training..

3. STATISTICAL ANALYSIS

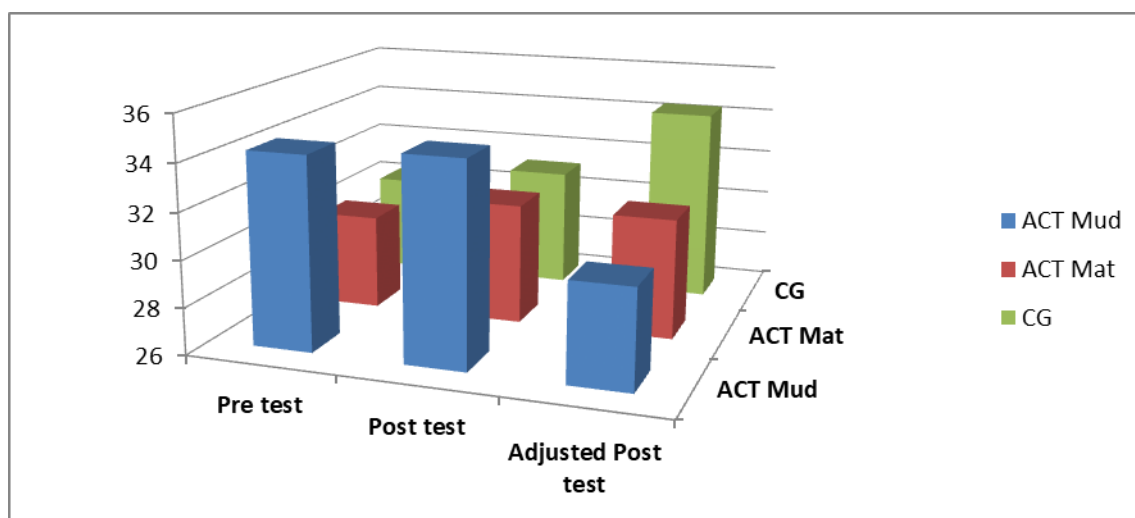
AI systems help teams analyze player and team performance in detail. Advanced computer vision and machine learning ANCOVA was carried out to compare the mean reaction time and agility performance scores between the three groups (ACT MUD group, ACT MAT group and Control group) and whether there are any key differences in the groups. The post hoc test (Bonferroni) is used to determine which specific group(s) show significant differences in reaction time and agility performance, specifically comparing the ACT Mud group and the ACT Mat group against each other, and the Control group. A significance level of 0.05 is used and to analyse the data, SPSS has been used in this study.

Table 1: Analysis of covariance on pre-test, post-test and adjusted Post - test means for Reaction time

Test		ACT MUD	ACT MAT	CG	Source of variance	Df	Sum of squares	Mean squares	F-ratio
Pre-test	Mean	34.28	34.63	34.83	B.G	2	2.36	1.1	0.104
	SD	3.74	2.37	3.78	W.G	42	474.73	11.30	
Post-test	Mean	30.07	31.19	34.50	B.G	2	159.07	79.53	10.760*
	SD	1.30	2.69	3.64	W.G	42	310.45	7.39	
Adjusted post	Mean	30.24	31.16	34.36	B.G	2	139.62	69.81	17.716*
					W.G	41	161.56	3.94	

*0.05 level, df (2, 42) and (2, 41), 3.23 * ACT MUD – Agility circuit training on Mud surfaces, *ACT MAT - Agility circuit training on Mat surfaces

The analysis of a one-way between two ANCOVA was carried out to determine the effect of ACT on the reaction time of Men Kabaddi players. The test result revealed that there is a significant change in the effect of ACT on the reaction time of men Kabaddi players. $F(2, 41) = 17.716$, $p = .000$, $\mu_2 = .464$. Additionally, the main effect of the covariant was also statistically significant: $F(2, 42) = .104$, $p < .901$, $\mu_2 = .480$.



*ACT MUD – Agility circuit training on Mud surfaces, *ACT MAT - Agility circuit training on Mat surfaces
*CG – Control group

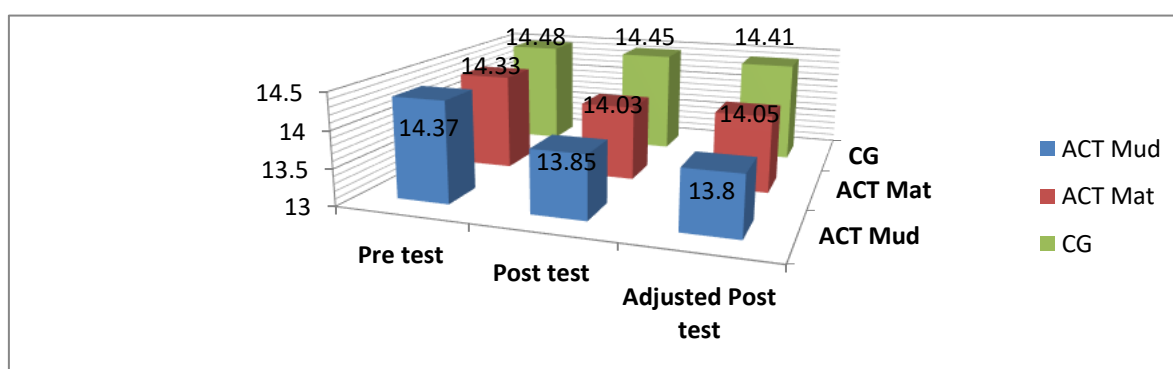
Fig 1: Reaction time pretest, post-test and adjusted post test scores

Table 2: Analysis of covariance on pre-test, post-test and adjusted post-test means for agility

Test		ACT MUD	ACT MAT	CG	Source of variance	Df	Sum of squares	Mean squares	F-ratio
Pre-test	Mean	14.37	14.33	14.48	B.G	2	0.17	0.09	0.384
	SD	0.42	0.43	0.55	W.G	42	9.39	0.22	
Post-test	Mean	13.85	14.03	14.45	B.G	2	2.82	1.41	10.273*
	SD	0.42	0.37	0.32	W.G	42	5.77	0.16	
Adjusted post	Mean	13.85	14.05	14.41	B.G	2	2.34	1.17	11.3
					W.G	41	4.25	0.10	07*

*0.05 level, df (2, 42) and (2, 41), 3.23 * Agility circuit training on Mud surfaces: ACT MUD, * Agility circuit training on Mat surfaces: ACT MAT.

The Analysis of a one-way between two ANCOVA is carried out to determine the effect of ACT on the agility of Men Kabaddi players. The test result revealed that there is a significant change in the effect of ACT on the agility of Men Kabaddi players. $F(2, 41) = 11.307$, $p = .000$, $\mu_2 = .355$. Additionally, the main effect of the covariant was also statistically significant: $F(2, 42) = 0.384$, $p < 0.683$, $\mu_2 = .264$.



*ACT MUD – Agility circuit training on Mud surfaces, *ACT MAT - Agility circuit training on Mat surfaces *CG – Control group

Fig 2: Agility pretest, post-test and adjusted post test scores

The present study examines the effects of Agility Circuit Training (ACT) on Men Kabaddi players practicing on mud and mat surfaces. The findings indicate significant improvements in both reaction time and agility. The pretest scores for reaction time and agility were included as covariates in the analysis. Subsequent post-hoc pair-wise comparisons, adjusted using Bonferroni correction, revealed a noteworthy enhancement in reaction time and agility for the Men Kabaddi players who underwent ACT on both surfaces compared to the control group. Specifically, the ACT group training on mud demonstrated a moderate improvement over the group training on mat in both reaction time and agility. These results suggest that while both surfaces play a crucial role in the effectiveness of ACT, the mud surface seems to have a greater impact on enhancing the reaction time and agility of Men Kabaddi players. The empirical evidence supports the conclusions of this study, highlighting the superior effectiveness of ACT on the mud surface compared to the mat surface for improving these athletic skills.

In many sports that emphasize agility, pivoting on the ground during cutting maneuvers is a key element, and the playing surface significantly impacts motor and technical skills. Previous studies have also shown significant variations in these skills across different surfaces [7]. Studies have also shown, that HIIT through a 50m drill significantly enhanced aerobic capacity in male state-level Kho-Kho players; high- intensity drills have proved most effective [8]. Male Kabaddi players' motor coordination ability was examined by a previous study. The study included 80 male Kabaddi players between 18 and 25. A clay surface provided better shuttle run performance than a mat surface for male Kabaddi players. Male Kabaddi players' motor coordination ability is significantly affected by the playing surface [8]. The process of adjusting to various playing surfaces is challenging for male Kabaddi players. Particularly when they move from clay to a mat surface, the friction and traction differences create a hindrance to their performance. Because clay and mat have different coefficients of friction and their feet will experience less friction. According to other studies, Male Kabaddi state- level players' motor coordination abilities are affected by the playing surface. Clay and mat surfaces, specifically, influence sport-level male players' motor coordination ability, with mat surfaces influencing motor coordination less than clay surfaces.

Comparison between inter-varsity Kabaddi and Kho-Kho players revealed significant differences in agility, diastolic pressure, and explosive strength [9]. Junior female Kho-Kho and Kabaddi participants show significant differences in reaction abilities and explosive strength, favoring Kho-Kho players [10]. Kabaddi players' agility is influenced by the playing surface, emphasizing the need for synthetic mats for improved international performance [11]. Interval training on Kabaddi floor mats and Kabaddi clay court improved reaction time and agility in Kabaddi participants, while the control group didn't [12]. Present study results were justified by the above-supporting studies that ACT on Men Kabaddi players on Mud and Mat surfaces show significant improvement in reaction time and agility.

4. CONCLUSION

The current objective of this study is to examine the effects of ACT interventions on reaction time and agility in Kabaddi players on mud and mat surfaces. After conducting a statistical analysis of the data, it was found that the reaction time and agility of players in the ACT mud group differed significantly from those in the control group, as evaluated by ANCOVA.

The findings suggest that players on the mud surface demonstrated greater agility and reaction time compared to when they were on the mat surface. This difference may be attributed to the traction, grip, or friction between the player's footwear and the surface. When a Kabaddi player transitions from a muddy surface to a mat surface, their performance may be negatively impacted by the change in friction and traction. A lack of adaptation to the new surface can result in difficulties maintaining balance and executing movements effectively.

5. REFERENCES

- [1] Chundu Venkata Rao and Dr.Y.Kishore.“Combined Effect of Strength and Plyometric Training Programme on Selected Motor Fitness Components of Male Kabaddi Players. International Journal of Recent Research and Applied Studies, Volume 1, Issue 2(12) July” 2014
- [2] J.M. Shepperd and W.B. Young. “Agility literature review: Classification, training and testing. In Journal of Sports.” Sciences24(9):919-32.
- [3] Baroud G, BM Nigg, D Stefanyshyn. Energy storage and return in sport surfaces Sports Engin. 1999; 2:173-180.
- [4] Mackenzie B. Ruler drop test. BrianMac Sports Coach;c2004. Available from: <https://www.brianmac.co.uk/rulerdrop.htm>
- [5] Semenick D. Anaerobic testing: practical applications.NSCA J. 1984;6(5):44-73.

- [6] Ahmad Itoo M, Jain R. The Effect of clay and mat surface on coordinative and skill ability of the Kabaddi Players. Int J Phys Educ Sports Health. 2020;7(5):214- 219. Available from: www.kheljournal.com
- [7] Chatterjee K. Effect of high and moderate intensity interval training on aerobic capacity of Kho-Kho Players, 2019. Available from: <https://www.researchgate.net/publication/338375553>
- [8] Singh Rathore V, Bahadur Singh A. Analysis of Physical and Physiological Parameters of Kabaddi and Kho-Kho Inter-Varsity Players. Am J Sports Sci Med. 2014;2(5A):13-16. Available from: <https://doi.org/10.12691/ajssm-2-5a-4>
- [9] Saha G. A Comparative Study on Explosive Strength and Reaction ability between Female Kabaddi and Kho-Kho Players. J Adv Sports Phys Educ. 2022;5(6):123-128. Available from: <https://doi.org/10.36348/jaspe.2022.v05i06.003>.
- [10] Ahmad Itoo M, Jain R. The Effect of clay and mat surface on coordinative and skill ability of the Kabaddi Players. Int J Phys Educ Sports Health. 2020;7(5):214- 219. Available from: www.kheljournal.com
- [11] Gururaj S. & Arumugam, S. Effect of interval training in varied surfaces on agility and reaction time among kabaddi players. J Emerg Technol Innov Res; c2018. p. 5. Available from: www.jetir.org

