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The Relationship Between Dexterity, Isokinetic Muscles Strength, Sprint Proficiency And Anaerobic Performancein National Handball Players

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ABSTRACT

Background: Handball is a strenuous intermittent team sport with specific requirements for anthropometric characteristics, technical skills, tactical understanding, and physical performance. Recent rule changes and the implementation of the “fast center” have placed greater physical demands on handball players. This development has put pressure on coaches and other responsible persons to consider athletic and performance parameters in more detail as important factors for team success.

Regarding the importance of specific conditional factors in professional handball, several qualitative and quantitative studies have been published. Some of these studies demonstrated that key characteristics in elite handball are endurance Agility aids performance in activities that require rapid changes in direction while maintaining balance, speed, strength, and body control. It is an important aspect in many sports such as netball and basketball. A good level of dexterity can translate to better performance and can give an edge over the competition. Sprint proficiency also progresses from a linear run to a change of direction and even a change of pace. The end result is a better-conditioned body for Handball. Therefore, the authors decided to further explore the role of isokinetic muscle

strength,dexterity, and sprint proficiency in anaerobic performance of National handball players.

Objectives: The purpose of the study was to analysis the relationship between dexterity, isokinetic muscles strength, sprint proficiency and anaerobic performance in national handball players.

Methodology: A cross-sectional research design was employed in which data was collected only once in a week. There were twenty-fourHandball players (Male & Female) of Higher education institutions who represented Higher Education Commission at National level competitions in Pakistanand volunteered to participate in this study. Data was collected by conducting Aerobic & anaerobic tests for measuring isokinetic muscle strength with one minute sit up test, dexterity was measured by 20-metershuttle run test, sprint proficiency was measured by 30-meter sprint test, and anaerobic performance was measured by using the Wingate test at 60, 150 and 180°/second.

Results: The mean age of the participants was 24.5 ± 1.8 years; mean weight 60.95 ±5.9 kg; mean height 169 ± 8.1 cm; mean body mass 22.4± 1.6; and mean VO2max 55.60 ± 6.7 ml/kg/min. A significantly positive association was observed between isokinetic muscle strength and dexterity (r = .867); muscle strength and sprinting proficiency (r= .844); and isokinetic muscle strength and Anaerobic performance (r= .824) at the 0.01 level. Regression analysis indicated that dexterity is a good predictor of anaerobic performance (p= .016). The results of Independent Sample t-test indicated significant difference between male and female players on anaerobic performance (p = .000), However, anaerobic performance was significant at 135^{o} on Wingate test.

Keywords: Dexterity, Isokinetic Muscle Strength, Sprint proficiency, and Anaerobic Performance

INTRODUCTION

Handball is a fast-paced body-contact Olympic sport, played by two competing teams of seven players (one player is a goalkeeper) on an indoor court (40 × 20 m) over two 30-minute periods. It is generally recognized that due to relatively recent changes in game rules (e.g. starting the game quickly from the centre) and improvements in the tactical use of rolling substitutions, the intensity of the game is increased. Players are also able to perform more high-intensity actions. Despite its popularity, a paucity of data exits to describe the game's physical demands.

What is clear is that anthropometric characteristics of the players vary depending on the position they play with backcourt and line players (pivot) being taller and heavier than wingers. Time-motion data from the elite men's game during the 2007 World Championships has indicated that playing time is different between positions with wingers (37.37 ± 2.37 minutes) and goalkeepers (37.11 ± 3.28 minutes) having more court time than either backcourt players (29.16 ± 1.70 minutes) and pivots (29.3 ± 2.70 minutes).The total distance covered during the game also varies between positions with larger distances covered by wing players (3710 ± 210 m) when compared to backcourt (2839 ± 150 m) and line player (pivot) (2786 ± 238 m) positions. More recent research on elite male handball players has shown that players cover a mean distance of 4370 ± 702 m during a game, most of which is spent performing low intensity actions that is interspersed by short duration, very high-intensity anaerobic actions. Such actions define the most important aspects of the game, as they represent offensive or defensive situations needed to score a goal and/or avoid conceding one.

The aim of this study is to determine the relationship between dexterity, muscular strength, sprint proficiency and anaerobic performance in national handball players.

Assessment of the physical capacities of athletes is one of the most important issues in modern sports, many test used in order that selection procedures, for screening candidates, or to monitor the efficacy of training regimes (Norkowski, 2002). Despite sports performance professionals and sports scientists focus on performance assessment, there are lack of research examining the relationships between various motor skills (Vescovi and McGuigan, 2008). There are a lot of motor skills in different sports, have kinematic, biomechanical and muscular similarities (Bobbert and van Zandwijk, 1999; Zajac, 2002), but examining correlations between these skills has proved elusive (Vescovi and McGuigan, 2008).Studies investigate relationships between sprinting and muscle strength performance have had different limitations and reported only weak and no relationships so far (Dowson et al., 1998).

Sports scientists have examined lower limb strength and power are frequently using the isokinetic knee joint test and the vertical jump test; some studies have focused on the correlation between performance in these two motor skills but have reported scattered findings (Iossifidou, 2005). This scattered findings may be due to a number of differences, such as joint angular velocities and the positioning of the participants, affecting muscle length and velocity of contraction, participant characteristics and methods used for calculation power of joint in isokinetic dynamometry (Iossifidou, 2005).

Many investigations in the past have compared measures of sports performance between athletes versus non-athletes and handball beginners versus non-initiators among hand players of different ages and skill levels between players with the most and least minutes played (Wilmore JH, 2014). In studies comparing handball players with non-athletes, several factors, such as height; and height when sitting; body weight; lean body weight; speed; power; and agility appear to be related to playing abilities.

However, in studies comparing handball players with athletes from different sports, beginners versus non- beginnersHandball players, with more and fewer minutes played, and netball players of different ages and skill levels, anthropometric measurements have been the only factors consistently associated with playing abilities (Popvic, 2014). For example, in studies comparing athletes in different sports, Handball players tend to be taller than soccer and volleyball, and baseball and netball players tend to be smaller than handball and basketball players.

In light of this earlier research, the association between playing abilities and anthropometric measures is clear, while the association between playing abilities and performance measures such as speed, agility, power, and muscle strength is yet not clear (Bakırcı, 2014). Contributing to this lack of clarity is the fact that previous studies on playing abilities have varied in methodology and have evaluated only a limited number of measures related to motor skills.

Many coaches and players compare games with actual wellness in this sort of game. Being fit as a fiddle is fundamental from a wellbeing view, however the accompanying parts of wellness are similarly important for elite handball players, which include cardiorespiratory wellness, strength (Chris Iliades, 2019), solid perseverance, deftness, adaptability, speed, agility, power, and muscle strength.

The principal part, cardiorespiratory wellness, alludes to the proficient inventory of blood, oxygen and supplements to the dynamic body by the heart and lungs during actual work. Vigorous exercise works on cardiorespiratory capacity and furthermore reinforces the heart muscle (Nystoriak, 2018). Aerobic exercises should be possible through any movement that requires persistently level of force exertion for a minutes (Akyüz, 2017).

In this sense, handball requires short and extraordinary times of movement, during which players consume a lot of energy at a fast rate. Anaerobic pathways are one more part of cardiorespiratory wellness and give energy to extreme focus exercises such as anaerobic. Consequently, anaerobic energy frameworks should likewise be all around created. The physiology basic the vigorous and anaerobic energy frameworks is intricate, and particularly in handball (Bender, 2019).

From one perspective, the high-impact framework, which supplies long haul energy, relies upon the presence of oxygen for the creation of adenosine triphosphate (ATP). This is the favored energy hotspot for practice enduring in excess of a couple of moments (McCormick, 2010). At the point when handball players start working out, both the vigorous and anaerobic energy frameworks are involved. Notwithstanding, the overall commitment of every energy source differs as indicated by the requests of activity, which thusly change contingent upon the power and length of the movement. Netball is "roughly 20% oxygen consuming (aerobics) and 80% anaerobic", and accordingly many elements impact the specific proportion of energy consumption for every player (Mancha, 2019).

Appointing accurate extents to suit all playing styles would be outlandish. It is generally acknowledged that handball is a game that requires a significant degree of anaerobic wellness. This is surely the situation when a game is partitioned into more limited portions. While the energy for extreme focus endeavors is gotten fundamentally from the anaerobic framework during the sport of handball, recuperation for resulting episodes of activity is worked with during rest periods by the vigorous framework (Calleja Gonzalez, 2015).

As mentioned above, the affinity between muscle strength, agility, and speed / sprint ability with anaerobic performance in handball players remains unclear. The present study aims to explore the relationship between these variables and predict the strongest variable for anaerobic performance for handball.

METHODOLOGY:

A cross-sectional research design was used in which data was collected only once over a period of one week. There were twenty-four Handball players (Male & Female) of Higher education institutions who represented Higher Education Commission at National level competitions in Pakistan and volunteered to participate in this study. Data was collected by conducting Aerobic & anaerobic tests for measuring isokinetic muscle strength with one minute sit up test, dexterity was measured by 20-meter shuttle run test, sprint proficiency was measured by 30-meter sprint test, and anaerobic performance was measured by using the Wingate test at 60, 150 and 180°/second.

The main objective of this study was to analyze the relationship between isokinetic muscle strength, sprinting ability, dexterity and anaerobic performance in elite handball players. For this purpose, anaerobic performance is defined as the work capacity during maximum exercise lasting approximately 10 seconds to 60 seconds (for example, 20-meter shuttle race test, one-minute squat test, and speed test 30 meters).

RESULTS

The relationship between isokinetic muscle strength, anaerobic performance, sprinting proficiency, and dexterity were evaluated using Pearson Product Moment Correlation analysis. All analysis were executed in SPSS for Windows version 23.0 and the statistical significance was set at $p < 0.01$. Regression analysis was applied to predict the relationship of isokinetic muscle strength, dexterity, and sprint proficiency for anaerobic performance. Independent Sample t-test was applies to analyze the mean differences of male and female players on anaerobic performance. The mean age of the participants was 24.5 ± 1.8 years; mean weight 60.95 ±5.9 kg; mean height 169 ± 8.1 cm; mean body mass 22.4± 1.6; and mean VO2max 55.60 ± 6.7 ml/kg/min.

Table-1 Relationship between Variables of Interest

		Isokinetic MusclesssStrength	Dexterity	SprintProficiency	Anaerobic
Isokinetic MuscleStrength	Pearson Correlation	1	.867**	.844**	.824**
	Sig. (2-tailed)		.000	.000	.000
	N	24	24	24	24
Dexterity	Pearson Correlation	.867**	1	.977**	.904**
	Sig. (2-tailed)	.000		.000	.000
	N	24	24	24	24
Sprintproficiency	Pearson Correlation	.844**	.977**	1	.863**
	Sig. (2-tailed)	.000	.000		.000
	N	24	24	24	24
Anaerobic	Pearson Correlation	.824**	.904**	.863**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	24	24	24	24

A significantly positive association was observed between Isokinetic muscle strength and dexterity (r = .867); Isokineticmuscle strength and sprinting proficiency (r= .844); and Isokinetic muscle strength and Anaerobic performance (r= .824) as shown in Table-1. The results are significant at the 0.01 level.

Table-2

Effect of Field Tests on Anaerobic Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-251.786	247.480		-1.017	.321
	IsokineticMuscle Strength	3.214	3.788	.155	.849	.406
	Dexterity	64.286	24.432	1.221	2.631	.016
	Sprint Proficiency	-12.054	11.245	-.462	-1.072	.297

Regression analysis indicated that dexterity is a good predictor of anaerobic performance (p= .016) as compared toIsokinetic muscle strength (p=.406) and sprint proficiency (p= .297) as shown in Table-2

Table-3 Male and Female Comparisons on Anaerobic Performance

	Levene's Test for Equality of Variances		t-test for Equality of Means					
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference

									Lower	Upper
Anaerobic	Equal variances assumed	25.000	.000	5.528	22	.000	75.00000	13.56801	46.861	103.138
	Equal variances not assumed			5.528	11.000	.000	75.00000	13.56801	45.137	104.862

The results of Independent Sample t-test indicated significant difference between male and female players on anaerobic performance (p = .000), as shown in Table-3.

DISCUSSION

The motivation behind this study was to decide the connection between Isokineticmuscle strength, dexterity, and sprint proficiency in national handball players. The second reason to conduct this study was to determine the association between these tests and the anaerobic performance of handball players. Other than that, male and female players were additionally compared on anaerobic performance by utilizing Wingate Anaerobic Test (WAnT). A significantly positive association was seen between Isokineticmuscle strength and dexterity (r = .867); muscle strength and sprint proficiency (r= .844); and Isokineticmuscle strength and anaerobic performance (r= .824) at the 0.01 level. Regression analysis demonstrated agility to be goodindicator of anaerobic performance (p=.016) when contrasted withIsokinetic muscle strength and sprint proficiency. The findings of Independent Sample t-test showed critical distinction between male and female players on anaerobic performance (p=.000), However, anaerobic performance was significant at 135o on Wingate test in this study.

The findings of the current study showed a positive connection between Isokineticmuscle strength and anaerobic performance. A huge connection between dexterity and anaerobic execution was likewise found. Solid positive relationships have been shown between execution in the anaerobic and agility.

A Further finding of this study is that of a huge connection betweenIsokinetic muscle strength and anaerobic execution. This outcome is like discoveries of past examinations. For example, Araujo, (2014) expressed that there was a critical connection between anaerobic forces, limit and muscle strength at all compression at various speeds. Notwithstanding, the aftereffects of this review showed that anaerobic presentation was critical at 135o on Wingate test. Additionally, Gharbi, (2015) researched the relationship

among solidarity and force. They additionally revealed positive association between muscle strength and anaerobic execution in netball players. In one more study by Yudha Isnaini, (2019) tracked down a huge association between muscle strength and anaerobic force in female players.

The consequence of this study demonstrated that exhibitions of various tests (muscle strength, agility, and sprint) were associated with one another in a gathering of male and female handball players. One might say that either the tests evaluated had comparable qualities or execution or one test can anticipate execution on one or more variable. Future research is recommended with different groups and with different methodologies for each group for further understanding.

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