European Journal of Molecular & Clinical Medicine (EJMCM)
ISSN: 2515-8260 Volume 07, Issue 11, 2020

Study of bilateral HGS difference in DM and ND hand grip strength in Right-handed and Left-handed players

Dr. Charushila Atul Rukadikar[1], Dr. Mundewadi S.A[2], Dr. Charulata Kadam [3]

Dr. Atul R Rukadikar [4]

[1]MBBS, MD Physiology, Assistant Professor, Department of Physiology

Zydus Medical College & Hospital, Dahod, Gujarat

[2]MBBS, MD Physiology, Associate Professor, Department of Physiology, Dr.VM GMC, Solapur, Maharashtra.

[3]MBBS, MD Physiology.

[4] MBBS, MD Microbiology, Professor and Head, Department of Microbiology, Zydus Medical College & Hospital, Dahod, Gujarat

Corresponding Author: Dr. Charushila Atul Rukadikar

Abstract

Background: The handgrip dynamometry measure expresses the physical ability of the player and can be used for comparisons with other sports. Handgrip power plays a vital role in cricket.

Aims and Objectives: To study and find out bilateral HGS difference in DM and ND handgrip strength in Right-handed and Left-handed players.

Material and Methods: A study was done by sampling 60 players of 50 players right-handed and 10 players of left-handed were recruited after screening for inclusion and exclusion criteria. All participants were tested for their handgrip ability using a handheld dynamometer.

Results: The results of the present study showed Bilateral HGS difference of Right-handed players is 7.50% (less than 10%) and the Bilateral HGS difference of Left-handed players is 5.35% (less than 10%).

Conclusion: We concluded that the Dominant handgrip strength (DM HGS) of players is higher than nondominant handgrip strength (NDM HGS) in both Right-handed and Left-handed players.

Keywords: Dominant, Nondominant, Handgrip strength Right handed and Left handed players.

Introduction

Handgrip strength has been a measure of strength evaluation since 1880. It is called the strength and strength of the muscles that can be created by their hands. It is the result of intense flexion with the maximum voluntary force of all finger joints, thumbs, and wrists that the subject can exercise under normal bio-kinetic conditions.

In biomechanical modeling, handgrip strength (HGS) is a fundamental parameter that has found many important applications in the development of ergonomic instruments, in the design of equipment and consumer goods, and sports practices [1,2,3].

The grip strength is important for the human body when performing prehensile and precision hand functions and is used as one of the key measures for measuring muscle strength. Also, it is a low-cost instrument for estimating a person's overall strength, which may reflect general

health conditions and the level of physical activity. Muscle weakness and low grip strength have been associated with disability and are considered predictors of sarcopenia, increased recovery time, and higher mortality, particularly in hospital patients [4,5]. However, the reference values for HGS needed to ensure the health, safety, comfort, and efficiency of staff and clients, as well as for clinical purposes and post-injury recovery, are lacking in many populations [6].

Several studies have reported correlations between grip strength and various variables; however, the predominant factor affecting handgrip strength remains uncertain. Any relationship can be developed by a study of the primary findings in the literature. Age has a significant impact on the strength of the grip for which a curvilinear correlation has been observed, increasing the strength of the age-old grip that peaks between 30 and 40 years of age and then decreases. The non-linear relationship between the sexes differs and is more pronounced in women. For at least another decade longer than females [7], males maintain their grasp. The gender difference is obvious at all ages and males normally have higher grip strength than females [8,9].

As muscle strength is a function of these characteristics, this is a result of the larger size and related muscle mass in males. Males typically have greater arm muscles and are more active than females in more strength-requiring activities. Strong associations between grip strength and body measurement (e.g. weight, height, and length of the hand) have also been recorded [10]. The results contradict the body mass index: some authors have suggested that the strength of the static grip is positively related to the body mass index (BMI), finding it to be a grip strength measure, while others have not found a significant association, concluding that the BMI does not influence the strength of the handgrip. The circumference of the elbow, the joint circumference of the thumb, the circumference of the palm, the length of the hand, and the length of the middle finger play a significant role in influencing the grip of the dominant hand [11, 12, 13].

In finger functions, such as the use of spoons or letter writing, laterality is particularly evident and has been known to be attributable to the more preferential and frequent use of one hand in daily activities. Numerous cases of lateral domination of muscle function have been published to date. Laterality is a multidimensional trait, and it is well known that 90% of individuals prefer to use their right hand for common manual tasks in the adult population, while about 10% of the population is left-handed [14].

In this study, we have done a study to find out bilateral HGS difference in DM and ND handgrip strength in Right-handed and Left-handed players.

Materials and Methods

Study design:

The present research was carried out in the sports physiology laboratory of the physiology department. The period of the study from December 2012 to November 2014 and the form of study is not followed up. Subjects were chosen on the basis of inclusion and exclusion criteria. Subjects were tested verbally and visually to rule out any history of past and present damage to the right hand or medical condition that could impact handgrip strength and anthropometric parameters. The present research was approved by the College Ethical Committee of Institutions.

Source of data:

A study was done by sampling 60 players of 50 players right-handed and 10 players of left-handed were recruited after screening for inclusion and exclusion criteria. All participants were tested for their handgrip ability using a handheld dynamometer.

Selection criteria:

The selection criteria of the subjects were based on the inclusion and exclusion criteria:

Inclusion criteria:

- Normal healthy cricket players and football players must have playing cricket and football from last 3 years.
- Subjects who were selected for university team and still playing at university level, state level or national level.
- Subjects with age group between 15-25 years.
- Subjects practicing daily for 2-3 hrs for 6 days a week.

Exclusion criteria:

- Subject age group below 15 years and above 25 years.
- Subjects who were not regularly practicing.

Method of Collection of Data

Subjects were verbally and visually screened to rule out any history of past and current injury to the right hand or medical condition which might affect handgrip strength and anthropometric parameters. Medical history was asked for scrutinizing the subjects, which come under exclusion criteria. A brief explanation of the procedure to the subjects and the demonstration of what is being tested was also given. The help of an interpreter was used in times of need. Readings were documented in the data collection form which included demographic data from all the participants including name, age, gender, hand dominance, ht, and wt before the start of the test.

Bilateral HGS difference is calculated from-

$$\frac{\text{Dominant hand grip strength} - \text{non-dominant hand grip strength}}{\text{non dominant hand grip strength}} \times 100$$

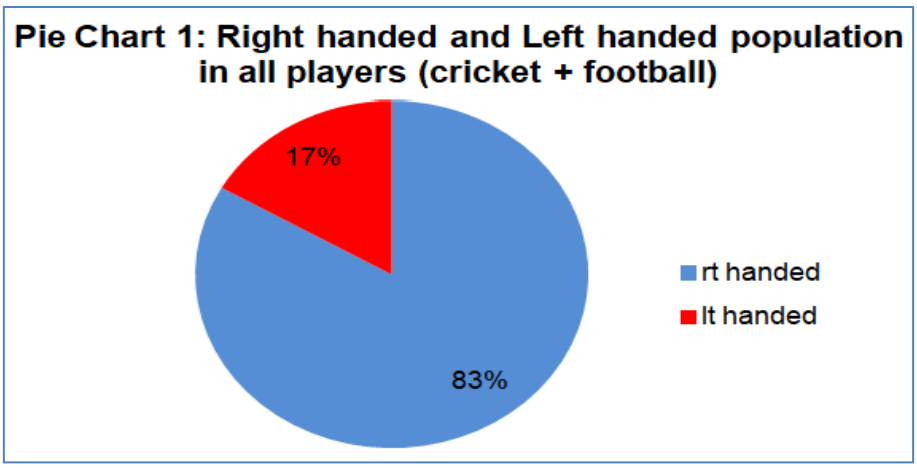
Statistical Analysis:

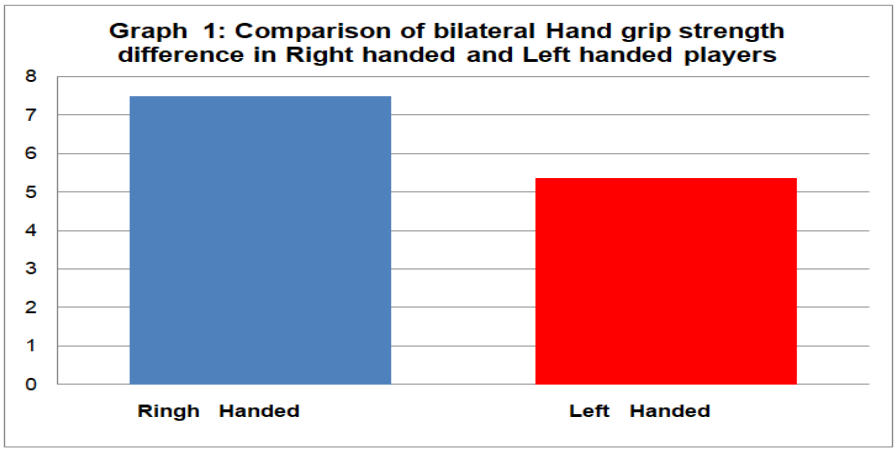
The data were summarized using descriptive statistics like %, mean, S.D. Descriptive statistics provide information about the distribution, variability, and central tendency of a variable. Descriptive statistical analysis has been carried out in this report. These tests were applied to know whether the difference observed in statistical parameters between different samples is due to sampling variation or not. Tests of significance applied in this present study were, Unpaired test was applied for the comparison between cricketers and football players for the variables of BMI, specific anthropometry, handgrip strength. Pearson correlation coefficient established a correlation of anthropometric parameter with handgrip strength. All the statistical calculations were performed using the software SPSS for windows (statistical package for social sciences) version 19.0.

Results

Table 1: Comparison of bilateral Hand grip strength (HGS) difference in Right handed and Left handed players.

	Right handed	**Left handed**
	Bilateral Hand grip strength difference	**Bilateral Hand grip strength difference**
N(60)	50	10
Mean	7.50	5.35





Discussion

In our research, the dominant handgrip strength (DM HGS) of players is higher than the non-dominant handgrip strength (NDM HGS) of both the right hand and the left-hand players. (Table 1)

Right handed population is Right handed players/ total players = 50/60 = 83% and left handed is left handed players/ total players = 10/60 = 17%. (Pie chart 1)

Bilateral HGS difference of Right-handed players is 7.50% (less than 10%) and the Bilateral HGS difference of left-handed players is 5.35% (less than 10%) (Graph 1)

The dominant hand is more commonly used by athletes for various sports activities. Thus, more exercise of the dominant hand will lead to more handgrip strength than non-dominant handgrip strength.

Similarity with our results, i.e. dominant handgrip strength (DM HGS) is more than nondominant handgrip strength (NDM HGS), is observed by other authors, Kamarul T (2006) [15], Ozcan A (2004) [16], Armstrong CA (1999) [17], Crossby (1995) [18].

Dissimilarity also shown our results, i.e. dominant and nondominant handgrip strength (DM and NDM HGS) having no significant difference, is observed by other authors, Reikeras O (1983) [19].

Similar results with our finding i.e. bilateral HGS difference is less than 10 %, is found out by other authors like Zverev Y (2001 bilateral hgs difference = 5.7% in Right handed and

4.5% in Left handed) [20], C.A. Armstrong (1999 bilateral HGS difference = 0.1-3%) [17], Bassey EJ (1993) [21], Ozcan A (2004 bilateral HGS difference 6%) [16].

Dissimilarity with our results i.e. bilateral HGS difference is more than 10 %, is found out by other authors like Crosby (1994) [18], Bassey EJ (1993) [21], Paul Peterson in Pennsylvania population (1989, bilateral HGS difference = 12.07%) [22], Hager (2002, for right handed player bilateral HGS difference = 10%) [23].

In Cricket, particularly dominant handgrip strength (DM HGS) is required for beating, bowling, throwing purposes, and in football; specifically, DM HGS is required for goal-keeping, throwing purposes.

With this discrepancy, effective individual training plans can be designed to organize unique DM hand exercises. If the side is abnormal, we can draw the correct inference. Thus, under the guidance, specific types of hand exercises can be organized as necessary by the skill of the player.

Conclusion

In Cricket, particularly dominant handgrip strength (DM HGS) is required for batting, bowling, throwing purposes, and in football; specifically, DM HGS is required for goalkeeping, throwing purposes. With this discrepancy, effective individual training plans can be designed to organize unique DM hand exercises. If the side is abnormal, we can draw the correct inference. Thus, under the instruction, various styles of hand exercises can be organized according to the requirements of the skill of the player. In this way, when choosing a sport, we can give the player a specific sports prescription. Our goal should be to help beginners choose the right sport. Cricket is recommended as a sport for beginners with good anthropometric parameters of the upper arm and handgrip strength.
In our study, it is observed that the dominant handgrip strength (DM HGS) of players is higher than nondominant handgrip strength (NDM HGS) in both Right-handed and Left-handed players.

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