

## COMPARATIVE STUDY OF MAXIMAL GRIP STRENGTH IN THE LEFT AND RIGHT HAND IN LEFT HANDED AND RIGHT HANDED INDIVIDUALS

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**Abstract: Background and objectives:** Maximal grip strength is an important parameter used during growth, aging, injury, rehabilitation, training or therapeutic trials. Handedness shows difference in qualities of an individual. Our objective is to compare the value of maximal grip strength between left and right hand of left handed and right handed subjects. **Materials and Method:** With the use of Jamar dynamometer maximal grip strength is measured in 21 left handed and 78 right handed subjects with standard procedure. **Results:** In this study we found that when we compare the left and right hand on right handed subject, there is significant difference between values with dominant (right) hand having significantly higher maximal grip strength. But the difference is not significant in left handed subjects. **Conclusion:** From the study we can conclude that in right handed subjects right hand is significantly dominant than left hand, though further studies are required to establish the values.

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### Introduction:

Handedness (also referred to as chirality or laterality) is a natural human attribute. It is defined by different distribution of fine motor skills between the left and right hands<sup>1</sup>. Various cerebral functions like speech, language, visuospatial relations, analysis of face, and recognition of musical themes and use of hand for fine motor movements have also been studied in detail in individual with their handedness. However, in the left handed persons their spatial talents may be well above average; a disproportionately large number of artists, musicians and mathematicians are left handed. Learning disabilities like dyslexia are more than 10 times common in left handed persons than in right handed persons<sup>2</sup>. Variation in nerve conduction with lateralization is also expected. So as there may be chance that maximal hand grip has some relevance with hand dominance.

Power and grip of individual may differ in left and right handed individuals. Currently same References data is used for maximal grip strength in the left hand and right hand between left and right handed persons. This study is done to compare the results maximal hand grip strength in the left and right hand of left and right handed individuals.

Over the past 15 years extensive literature has described a relationship between grip strength and various functional, clinical, psychological or psychosocial parameters in different populations, particularly in elderly people<sup>3</sup>. Measurement of maximal Grip strength (MGS) is an important test to follow people during growth, aging, injury, rehabilitation, training or therapeutic trials. Its measurement is performed using dynamometers, which estimate the muscle strength primarily generated by the flexor muscles of the hand and the forearm. Different types of dynamometers are available in the market for measuring the grip strength, with such devices work on the principles as hydraulic, pneumatic, mechanical and electronic<sup>4</sup>.

These dynamometers vary in terms of their mechanism, performance, display mode and energy supply. The hand grip dynamometer uses a spring to measure maximum isometric strength of the hand and forearm muscles. The Jamar dynamometer is the most widely reported device used to measure grip strength<sup>5</sup>. Eighty percent of occupational therapy schools and clinics in the United States use the Jamar dynamometer as their usual instrument to assess grip strength<sup>4</sup>. The Jamar has many useful features for routine screening as well as in the evaluation of hand trauma and diseases

e. The objectives of this study are to compare normative data for grip strength between left handed and right handed individuals using this dynamometer.

#### Methods:

##### Participants:

After taking local ethical committee permission Healthy male subjects, aged from 25 to 39 years old were recruited randomly from the surroundings. In general, grip strength shows highest measurements within the 25 to 39 age group for male subjects (Ref Meriowetz) and it was found that it declined thereafter gradually. Total number of subjects are 99. Of them 21 subjects are left handed and 78 were right handed subjects. The criteria for exclusion of subjects for the study were any neurological, neuromuscular or other disorders that could affect muscle strength, any history of injury, disease, pain or discomfort involving the upper limbs in the last two years<sup>5</sup>, and practicing of a sport activity at a national level. Subjects were informed about the terms of the experimental protocol and procedures before giving their written consent. Body mass index is also taken into consideration<sup>6</sup>.

##### Procedure:

The height and weight of the subjects were recorded as well as an estimation of the percentage of body fat mass using an impedance metric scale (Tanita TBF-543). Anthropometric hand data were measured by the experimenter using a standard 1000-mm tape measure.

Dominant side was defined as the hand with which the subject writes and do fine motor activities. Devices were checked using standardized operating procedures to get accurate results.

The subjects were seated on a height-adjustable plinth in order to obtain a right angle at the hip, knee and Anklejoints with the legs being vertical and feet flat on the ground. The subjects had their shoulders adducted and their testing arm close to their body, with their elbow in full extension.

Subjects were verbally encouraged to produce their maximal grip strength (MGS). Two trials were first

recorded, consisting of a 2-4-second maximal contraction, with a 30-second rest period between each trial. The difference between two recording should be less than 10% otherwise the procedure is to be repeated after sometime.

##### Statistical analysis:

Norms were established in kg. The Maximal grip strength values between the right and left sides of left handed and right handed subjects were compared taking into account the dominance effect. The Maximal grip strength values between the dominant and non-dominant sides in both right-handed and lefthanded groups were presented in terms of mean +/- SD. Unpaired-t Test was used for comparison of two groups. P value less than 0.05 was considered as significant.

Left Handed Subjects	Mean (Kgs)	SD
Left hand	37.57	3.27
Right hand	35.81	2.95
p>0.05 (0.074)		

**Table 1:** Comparison of maximal grip strength in left hand and right hand of left handed subjects

Right Handed Subjects	Mean (Kgs)	SD
Left hand	30.15	3.41
Right hand	37.20	3.46
P<0.05 (0.00001)		

**Table 2:** Comparison of maximal grip strength in left hand and right hand of right handed subjects.

On comparison Table 2 shows the difference in the values of maximal grip strength in left and right hand is significant in right handed subjects. But table 1 shows the same is not significant in left handed subjects.

**Results:**

After comparison it was found that in an left handed individual the difference between MGS in left and right hand is not found significant, but in right handed individual MGS for right hand is significantly higher than the left hand in same individual.

**Discussion:**

This study established normative data of maximal grip strength in healthy subjects aged from 25 to 39 years old and showed that maximal grip strength has significant difference in the value in right and left hand of right handed individuals, while in the left handed difference is not found significant. Below are the few studies related to that. In a study done by Nurgul et al It is found that the dominant hand is significantly stronger in right handed subjects but no such significant difference between sides could be documented for left handed people<sup>8</sup>. The findings of the present study done by Shyamal Koley et al<sup>9</sup> indicate that statistically significant differences ( $p < 0.05$ ) were found for hand grip strength both in males and females between right hand dominant and non-dominant groups ( $t=3.13$  and  $2.78$  respectively) and left hand dominant and nondominant groups ( $t=2.66$  and  $3.13$  respectively). When comparisons were made between dominant right and left hand groups and non-dominant right and left hand groups, both in males and females, statistically no significant differences were noted in any case. In a study done by Jean et al<sup>10</sup> The right-handed subjects were significantly stronger on their dominant side (mean difference:  $2.3 \pm 3.7$  kg;  $p < 0.0001$ ); this was not the case for the left-handed subjects (mean difference:  $0.6 \pm 5.1$  kg;  $p = 0.775$ ).

The study done by Koley et al<sup>11</sup> revealed significantly higher rate of force for left hand in left-handed group, as compared with left hand of right-handers in both UL and BL tasks ( $p$

Ertem et al<sup>12</sup> in his study concluded that the difference between maximum and average of three consecutive measurement of grip strength was found significant for both hands. As the

significant difference was found between RGSmax (Maximum Grip Strength of Right Hand) and RGSav (Average Grip Strength of Right Hand); LGSmax (Maximum Grip Strength of Left Hand)/LGSav (Average Grip Strength of Left Hand) measures for RDH. RGSmax and LGSmax were correlated only for LDH. Therefore, average of three consecutive measurement of grip strength is more consistent for standard hand evaluation.

Peterson et al in the study of grip strength and hand dominance in 310 students (challenging 10% rule) found 12.72% difference between left and right hand for right-handed subjects and a -0.08% difference between left hand and right hand for left-handed subjects<sup>13</sup>.

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