Original Article

BMI and Hand Grip Force: Boys Win The Lead

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Objective: To gender in young adults via PowerLab and to observe the role of BMI in connection to Hand Grip Force.

Methods: A total of 30 participants involved in the study consisting of 15 boy and 15 girls, ranging between 20 to 23 years of age. All were physically healthy and no one on any medication nor involved in any physical training program. PowerLab along with hand grip transducer as hardware and Lab tutor as software were used to measure Grip force values. For weight and height measurement Adult Weighing Scale was used for each volunteer.

Results: We found >350% high value of maximum grip force in boys as compared to girls. Mean hand grip force was 48% raised in boys than girls. Also a 70% increased hand grip force was found in boys just before fatigue. A direct relation existed between BMI and Hand Grip Force in boys. While in girls, we observed, an increase in Mean Grip Force, but a decrease in Maximum Hand Grip Force and Hand Grip Force just before fatigue with increased BMI.

Conclusions: Thus boys have got higher Hand Grip Force than girls, in terms of maximum, average and just before onset of fatigue values. The BMI showed a direct relation with Hand Grip Force in boys. Although in girls, it was in inverse relation with Hand grip force and grip force just before fatigue; but in direct relation with Mean grip force.

Keywords: hand grip force, power lab, hand grip transducer

Introduction

Hand Grip Force is devoted to unit forces with zero ultimate value applied by hand digits on any object with contact interface.[1] Hand digits exert forces mainly because of the activation of the flexor digitorum profundus and the flexor digitorum superficialis muscles, however intrinsic and extrinsic muscles too participate physiologically in the production of grip force.[2] The maximum grip force is obtained by forceful flexion of all fingers of hand with the maximum voluntary power under physiological bio-kinetic environment.[3] Muscle fatigue is termed as a motor insufficiency that leads to gradual decline in maximum force or strength of muscle and it can be quantified through force reduction of muscle.[4]

Here we aim to assess the difference of Maximum and Mean hand grip force, with respect to gender in young adults via PowerLab.

PowerLab is considered the world's first data acquisition system designed for the field of life sciences research, which provides faster results with computed analysis.[5] This advanced digital data recording technology comprised upon a hardware and software, with improved applications and efficiency in terms of various human physiological parameters including muscle activity.[6] Hand grip force was used to be measured in kilograms, pounds, milliliters of mercury and even in Newtons;[7] however on PowerLab the grip force can be quantified and analyzed in percentages.

Methods

Thirty participants involved in this study through random sampling, consisting of fifteen boys and fifteen girls, ranging in-between 20-23 year of age. All were physically healthy and no one was on any medication nor were they involved in any physical training program. Also all participants were with right hand dominance. PowerLab along with hand grip transducer as hardware was used in the study and Lab tutor as software were used to get related Grip force values.

When Volunteer was instructed to grip the transducer in his/her right fist, "Grip Force Calibration" was directly obtained on window by connecting the "Grip Force Transducer" into the main Hardware of PowerLab, as showed in Figure 1a & 1b given below. Grip Strength showed in percentage (%) on y-axis and Time in seconds on x-axis. On maximum squeezing the transducer peak grip force values was obtained. Labeling on the digital graph could also be done for the identity of the volunteer. Moreover on both axis the scales could also be adjusted. BMI values were

taken in kg/cm via "Adult weighing scale".

For more than two groups one way ANOVA (analysis of variance) was applied on the data, using SPSS version 16. Where value of alpha (∞) was considered 0.05 i.e. 95 % confidence interval was selected. Lastly analysis among different groups was expressed in terms of p-value (Probability value), for evaluation of statistical significance.

Fig-1a: MLT004/ST Grip Force Transducer

Fig-1b: Sitting position of the Subject holding Grip Force Transducer.

Results

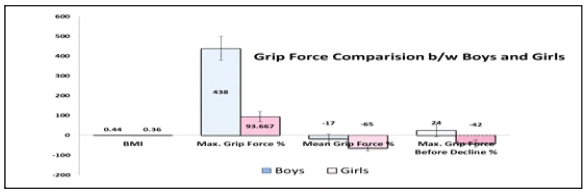

Fig-2: Bar graph showing Comparison of BMI and hand muscle grip force of the boys & the girls on Power lab (p=<0.0001).

We found a high value for maximum grip force in boys as compared to girls of same age group, >350 % increased value for boys comparing to their counterpart girls. **(Fig-2)**

The average grip force is higher in boys as compared to girls with a rise of 48% in boys, although the average values for both genders are in negative numerical, which means that average grip force is too low for hand muscles with respect to our unit of analysis. **(Fig-2)**

A 70 % rise in maximum hand grip force just before onset of fatigue, in boys as compared to girls. **(Fig-2)**

Discussion

In connection to grip force the muscular anatomy of human digits consisted of two major groups of muscles, known as intrinsic and extrinsic muscles[2]. The bellies of the intrinsic muscles lie in hand, while the bellies of extrinsic muscles are placed in forearm[8]. Previously a study conducted on Australian population used dynamometer with standardized positioning of the subjects in order to quantify hand grip strength[5]. According to another research hand grip force can be measured in terms of total static force by which hand can squeeze a dynamometer[9].

The potential contributors that act as bond among human digits included connective tissue, which provide mechanical connections between fingers[8], multi-tendon extrinsic muscles of hand and neural factors such as overlapping cortical projections in fingers[10]. All of these possessed a key role in isometric hand muscle force[10]. A static work or push against a stable resistance is stated as Isometric force[11]. Many other factors influence grip force and muscle strength is one of them, which is mainly determined by the interplay of flexors and extensors in each muscle group[8].Other factors which affect hand grip force included as age, gender, ethnicity, fatigue, time of day, nutrition, any pathology or pain, and hand dominance (right or left)[12].According to a study the dominant hand owns approximately 10% more strength than the non-dominant one, while other group of researchers argued that dominant hand carries about 12.7% more strength as compared to other[3].

Gender based analysis of grip strength has been shown higher grip force in males at all ages compared to counterpart females. While specifically analysis of hand grip force with respect to different age groups confirmed that maximum grip strength present in the fourth decade of life in both genders and then begin to decline gradually[13].

Conclusion

The boys have more hand grip force than girls in terms of maximum, average and just before fatigue onset values, measured through PowerLab. Although .the average grip force was in negative numerical, indicating that the Mean hand grip force was quite less than its maximum value. All was with satisfactory significant differences.

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