



CORRELATION STUDY OF AGE WITH GRIP STRENGTH AND PINCH STRENGTH IN HEALTHY INDIVIDUALS

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ABSTRACT

Introduction: Deterioration in hand function in the elderly population is mostly secondary to age related degenerative changes in muscle, vascular and nervous system. Evaluation of hand strength can provide an objective index of general upper body strength.

Aim: To determine the correlation of age with grip strength and pinch strength in healthy individuals.

Methodology: This was a prospective study with 110 healthy subjects within the age group of 20-74 years. All the individuals in the study are divided in to 11 age groups of five years interval. Grip strength and pinch strength of each subject were recorded with hydraulic hand grip dynamometer and pinch gauge respectively. Then the data was calculated for further evaluations.

Results: The highest and lowest grip as well as pinch strength was found in age group 30-34 year and 70-74 years respectively. The value of correlation coefficient, 'r' between age and grip strength was found to be -0.945 and between age and pinch strength was found to be -0.890 suggesting strong negative correlation of age with pinch and grip strength.

Conclusion: The study concludes that with increasing age, grip strength and pinch strength decreases.

KEYWORDS : Age, grip strength, pinch strength.

INTRODUCTION

Grip strength is defined as the force applied by the hand pull on suspend from objects. Grip strength in general also used by strength athletes, referring to muscular power and force that they can generate with their hands. Many factors including fatigue, hand dominance, (1) time of day, age, (2,3,4) nutrition, occupational demand, pain, co-operation of patient, hand injury, (5) pain and sensory loss can influence the strength of the grip, (6) hyperhydrosis, (7) posture and dynamometer setting. (8,9)

Reliable and valid evaluation of hand strength can provide an objective index of general upper body strength. Hand grip strength testing has long been used as a tool in the clinical assessment of hand and wrist injury. Grip strength measurement have a variety of clinical applications like assessment of chronic disability, response to treatment, work capacity post hand injury, in determining the sincerity of effort.

Hand grip dynamometer and pinch gauge are used to measure grip and pinch strength respectively. It measures the endurance of muscles in our forearm and hand. Using it will increase the performance at work and decrease chances for injury. Hand function decreases with age in both man and women especially after the age of 65 years. Overall from age of 40-80 years, muscle mass decreases in relation to body weight by about 30-40%. From the age of 40-80 years, a person's grip strength decreases up to 60%. (4,10)

Deterioration in hand function in the elderly population is to a large degree secondary to age related degenerative changes in muscle, vascular and nervous system. The purpose of our study was to determine the correlation of age with grip strength and pinch strength. Therefore it was hypothesized that there is a strong negative correlation of age with grip and pinch strength.

METHODOLOGY

The study included 110 volunteers (58 men and 52 women)

aged 20 to 74 years. Participants were recruited from G.J.U. campus and Red square market of Hisar. Subjects in the age group of 20 to 59 free from any disease or injury that could affect their upper extremity strength were included in the study. For subjects 60 years and above had less stringent criteria like no acute pain in their arms and hands and at least 6 months post-hospitalization. Patients with neurological disease and history of inflammatory joint disease were excluded from the study. All the subjects included in the study gave their inform consent.

All the individuals in the study are divided into 11 age groups of five years intervals. Grip strength and pinch strength of each subject were recorded with hydraulic hand grip dynamometer and pinch gauge respectively. For both the measurements subjects were made to sit in a straight backward chair with shoulder adducted and neutrally rotated, elbow flexed at 90 degree, forearm in neutral position, wrist in 0-30 degree of extension and 0-15 degree of ulnar deviation.

For grip strength measurement, the handles of hydraulic hand grip dynamometer were squeezed towards each other with maximum voluntary force by the subject which was maintained for about 5 seconds. It must be reset before each test. Then the pinch strength was recorded by holding the pinch gauge between thumb and index finger with application of maximum voluntary force by the subject and maintained for 5 seconds. The grip strength and pinch strength both were calibrated in kilograms and pounds of force.

Subjects performed three maximum attempts for each measurement and average values of these trials were recorded. One minute rest was given between each attempt so as to minimize the effect of fatigue. Then the data was calculated for further evaluations.

Statistical Analysis

Categorical variables were presented in number and percentage and continuous variables as mean +/- SD and median. Karl Pearson's coefficient of correlation was used to determine the degree of linear relationship between two variables. If both the variables are increasing or decreasing ($r=0.1-1.0$) then the correlation was considered to be positive. If one variable is increasing and other is decreasing ($r=-0.1-1.0$) then correlation was considered to be negative.

RESULTS

Table 1: Pinch Strength And Grip Strength Of Subjects With Respective Age Groups.

S.No	Age group (in years)	Mean +/- SD of pinch strength (in kg)	Mean +/- SD of grip strength (in kg)
1.	20-24	6.721 +/- 1.55	33.263 +/- 1.476
2.	25-29	7.621 +/- 1.46	37.263 +/- 1.45
3.	30-34	7.775 +/- 1.20	37.429 +/- 1.174
4.	35-39	7.33 +/- 1.28	32.998 +/- 1.29
5.	40-44	6.988 +/- 1.29	30.463 +/- 1.28
6.	45-49	6.342 +/- 0.996	29.83 +/- 1.20
7.	50-54	6.169 +/- 1.069	26.63 +/- 1.06
8.	55-59	5.916 +/- 1.52	25.196 +/- 1.23
9.	60-64	5.439 +/- 1.38	25.397 +/- 1.19
10.	65-69	5.715 +/- 1.188	22.196 +/- 1.21
11.	70-74	4.847 +/- 1.479	18.33 +/- 1.40

Table 1 shows that the mean of pinch strength and grip strength is decreasing with increasing age. The highest grip strength was 37.429 kg found in age group 30-34 year. The least grip strength was 18.33kg found in age group 70-74 year. Whereas, the highest pinch strength was 7.775 kg found in age group 30-34 year. The least pinch strength was 4.847kg found in age group 70-74 year. The value of correlation coefficient i.e. 'r' between age and grip strength was found to be -0.945 and between age and pinch strength was found to be -0.890. Both the 'r' values indicated that there is strong negative correlation of age with grip and pinch strength which suggests that with increasing age, pinch and grip strength decreases.

DISCUSSION

Measurement of grip strength is an important component of hand rehabilitation. It assesses the patient's initial limitations and provides a quick reassessment of patient's progress throughout the treatment. In sports, hand grip is an important, though often overlooked a component of strength in sports. Grip feats have recently gain acceptance as a sport in their own right with competitions being held with regularity event include-one arm dead lift, closing of torsion spring hand grippers, vertical bar lifting, pinch apparatus, nail bending etc.

The aim of the present study was to investigate the correlation of age with grip strength and pinch strength and comparison of correlation of age with grip strength and with that of pinch strength. The results revealed that there is a strong negative correlation of age with grip strength and pinch strength and there is no significant difference found in correlation of age with grip strength and with that of pinch strength.

Previous studies have established that there is a relationship between hand strength and age. This is confirmed in present study. According to present study, highest grip strength scores occurred in 20 to 30 age group and for pinch (lateral or key) strength the average scores were relatively stable from 20 to 44 age group, with a gradual decline from 45 to 74 years. A high negative correlation was seen between grip strength and age and also between pinch strength and age.

Virgil Mathiowetz et al conducted a study and found that the highest grip scores occurred in the 25 to 39 age groups. For tip pinch strength the score were stable from 20 to 59 years, with a

gradual decline from 60 to 79 years. They concluded that a high correlation was seen between grip strength and age but a low to moderate co-relation between pinch strength and age.(3)

The present study is supported by Vigil Mathiowetz et al. in that there is a co-relation of age with grip strength and pinch strength but it contradicts in that the co-relation of age with grip strength was found to be equal to correlation of age with pinch strength. Present study has a limitation that it has a small sample size and the data was collected from a limited geographical area.

CONCLUSION

The present study concludes that there is a strong negative correlation of age with grip and pinch strength. Study also shows that the correlation of age with that of pinch and grip strength is almost equal. This proves the fact that as the age increases, pinch and grip strength decreases accordingly.

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