The Evaluation of Hand Strength in an Aging Population

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Background

Muscular deterioration with age: Muscular deterioration is a well known effect that aging has on individuals. As a person gets older, their muscles naturally become worn down and more atrophied as compared to their younger counterparts. The ability of an individual to perform their activities of daily living may be compromised by low muscular strength even in healthy older individuals. There is mounting evidence to show not only endurance capacity but also strength is a predictor of health, especially in elderly people. Many studies have shown a correlation between muscular strength and future morbidity, disability, and mortality in these individuals and many of them are subjected to a steady decline in muscular strength, because the vast majority are inactive.

How to prevent muscular deterioration with age: Exercise is a key component to counteract the effects that aging has on one's muscle health. Aging is associated with changes in musculoskeletal and sensory changes in the body, and conventional strength, balance, and gait training in older individuals can significantly improve their lower extremity muscular power and function. Exercise may help prevent the adverse effects that aging has on the human body.

Why we pretest: Geriatric patients may sometimes be referred to see a physical therapist. A lot of the time this category of patients are going to physical therapy to get an individualized workout in a clinically supervised setting, because they have let their bodies go for too long, and are not ready to conquer the gym quite yet. A physical therapist is likely to pretest the patient before establishing an exercise routine for the individual. It is important to pretest a person before establishing an exercise regimen for a number of reasons. It is good way to know where to start the individual with their program and to know what their strength and weaknesses are from the beginning. It is also a good idea to pretest the patient to determine some initial goals, and then evaluate, and progress those goals at a later date to see the improvement of the person.

Why test hand strength: There are many quantitative anthropometric pretest measures that may be done on an individual, one specifically being hand strength dynamometry. Hand strength measurements have been proven to demonstrate significant correlations when compared with measures of functional mobility, monitoring changes in strength, and for explaining limitations in the functioning of older individuals

Ways to test hand strength: Two anthropometric ways to measure hand strength are by the use of grip and pinch strength dynamometry. With a grip strength dynamometer, the patient will hold the instrument in their hand between their thumb and other four fingers and squeeze it as hard at they can. A measurement will then be recorded. With a pinch strength dynamometer, the patient will hold the instrument between their thumb and first finger and pinch as hard as they can while the tester writes down the measurement.

Purpose

The purpose of this study was to evaluate the effects of age on the hand strengths of individuals between the ages of 15 and 80.

Methods

20 apparently healthy subjects volunteered to participate in this study. Their ages ranged from 15-79 years of age (42.3±22 years old). Their heights ranged from 175.01±11.91 centimeters, and their weights ranged from 76.20±15.79 kilograms. Upon arrival at the testing sight, the subject was asked to read over and sign an informed consent document. The procedure was then explained to the subject in detail. Basic demographic information was obtained on each subject including: age, weight, height, and dominant hand side. After that, the subject was seated in a straight-backed chair, and an initial blood pressure and heart rate were taken with a wrist reader blood pressure cuff. The subject was shown how to hold the grip strength dynamometer, and the instrument was then given to them to hold. The subject held the grip dynamometer in their dominant hand with their elbow adducted at a 90˚ angle by their side. The subject was then told to squeeze the grip dynamometer as hard as they could. This was done 2 additional times with a rest period of about 5 seconds between each trial. An average of the 3 readings was be reported. Demonstrations on how to hold and use the pinch strength dynamometer were then shown to the subject. The subject was instructed to hold the pinch strength dynamometer in their dominant hand, between their thumb and first finger, with their elbow adducted at a 90˚ angle by their side. The subject was then told to pinch the device as hard as they could. This was done 2 additional times with a rest period of about 5 seconds between each trial. An average of the 3 readings was to be reported. After the pinch strength was measured, the wrist reader blood pressure cuff was then placed on the subject again, and a final blood pressure and heart rate reading were obtained.

Results

Table 1: All Subject Demographic Data

20 subjects	Mean	SD	Max	Min
Height (cm)	175.006	11.91080553	193.04	149.86
Weight (kg)	76.2	15.787758	97.27	47.72
Age (yrs)	42.3	22	79	15

Table 2: Young Group Demographic Data

11 subjects	Mean	SD	Max	Min
Height (cm)	175.7218182	9.626444638	193.04	160.02
Weight (kg)	71.7309091	± 13.302122	79.09	54.54
Age (yrs)	25.63636	9.038028	15	46

Table 3: Old Group Demographic Data

9 subjects	Mean	SD	Max	Min
Height (cm)	174.1311111	± 14.81666667	193.04	149.86
Weight (kg)	81.6622222	± 17.6001604	100.0	47.72
Age (yrs)	62.55556	13.83032	79	52

Results (cont'd)

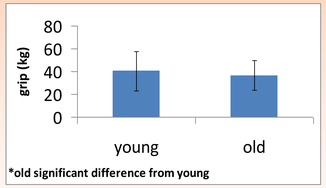

Figure 1: Means and standard deviations of young and old group for grip strength measurements

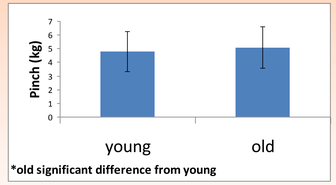

Figure 2: Means and standard deviations of young and old group for pinch strength measurements

	t test: Resting and Final Systolic Blood Pressure	*p* value
Young Group	0.014124	p= 0.05
Old Group	0.383748	p= 0.05

	t test: Resting and Final Heart Rate	*p* value
Young Group	0.044995	p= 0.05
Old Group	0.298299	p= 0.05

Table 4: Results of *t* test run between Systolic Blood Pressures and Heart Rates for the two groups

	t test: Male and Female Grip and Pinch Strength	*p* value
Grip	0.000591	p= 0.05
Pinch	0.037129	p= 0.05

Table 5: Results of *t* tests run between male and female grip and pinch strengths

Conclusions

As indicated in Figure 1 and Figure 2, no significant differences were found between the grip and pinch strengths of younger and older individuals. While the analysis between resting and final systolic blood pressures of the younger and older group revealed a significant difference in the younger group, but not in the older group (Table 4). The findings of the analysis run between the resting and final heart rates of the younger and older group revealed another significant difference in the younger group, but not in the older group (Table 4). The data in Table 5 shows the difference between male and female pinch and grip strengths. This particular test revealed a significant difference in both the grip and pinch strength by gender but not by age. The results of this study found no statistically significant difference between the grip and pinch strengths of old and young people. Our findings are not consistent with the majority of the scientific literature, but are consistent with those of Hanten et al.'s study in which weak correlations were found between age and grip strength.