The Effects of Hand Osteoarthritis on Hand Grip Strength

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Introduction

Hand osteoarthritis (HOA) is one of the most common joint disorders in elderly people. Osteoarthritis is known as degenerative arthritis since it is a condition in which the cartilage wears out between joints causing the bones to rub directly against other bones. Along with causing pain, it can limit mobility and range of motion, making it difficult for a person to grasp or use small objects, such as keys or pens. Other functional consequences may include hand weakness and force deficit. Depending on the severity of HOA a person has, the mobility, pain, and level of joint stiffness varies.

Purpose

The purpose of this study was to determine the effects of hand osteoarthritis on hand grip strength.

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Method

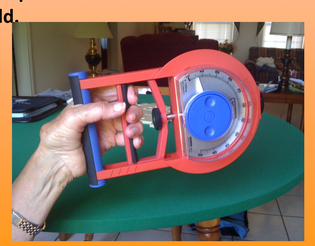
Participants

9 male and 21 female adults within the ages of 51-84 y were recruited to participate in this study. 15 participants were self-diagnosed with HOA and 15 participants claimed to have no HOA.

Instrumentation

A T.K.K. 5001 Grip-A Grip Strength Dynamometer (0-100 kg) was used to test the participants hand grip strength and endurance. A ReliOn Hem-741CREL automatic blood pressure monitor was used to measure participants heart rate and blood pressure before and after each test. A Rate of Perceived Exertion Scale (RPE Scale) was used to measure the participants level of difficulty for each test. A stopwatch was used to measure the length of time participants performed an isometric hold.

A Health And Quality of Life Outcomes Symptom Severity Scale questionnaire was used to determine the participants HOA severity.



Method (cont'd)

Procedure

Each participant began by filling out a questionnaire regarding the severity of the pain in their hands as a result of osteoarthritis. Blood pressure (BP) and heart rate (HR) were monitored before and after each test throughout this study. Three maximum voluntary contraction (MVC) tests were performed with the participant's dominant hand using a dynamometer. An RPE scale was used to determine the level of difficulty the participant experienced during the test. The best of the three trials was used for the results. The participant then performed an endurance test, in which they held the dynamometer with their dominant hand at thirty percent of their best trial for the MVC test for as long as they could (450 seconds maximum). Their RPE at the end of the test was recorded.

Statistical Analysis

Two- tailed t-tests was used to determine if there was a significant difference in hand grip strength and endurance between the participants with HOA and the participants without HOA. The alpha level was set at α=0.05. For this study, data were analyzed using Microsoft Excel 2010. The variables were age, hand grip strength (kg), hand grip endurance (kg), Rate of Perceived Exertion (6-20), time (seconds) on an isometric hold (IH), blood pressure (mmHg), and heart rate (bpm) .

Results

The t-test for hand grip strength (kg) between participants with HOA and participants without HOA showed a p-value of p=0.00324, which was less than the alpha level. The t-test for handgrip endurance (IH) between participants with HOA and participants without HOA showed a p-value of p=0.00539, which was also less than the alpha level. Therefore the null hypothesis was accepted. There was a significant difference between hand grip strength and hand grip endurance between HOA participants and non-HOA participants.

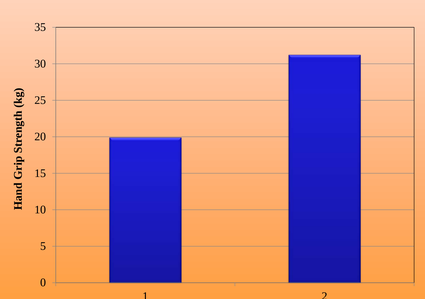


Figure 1: The Averaged Relationship Between HOA Participants (1) And Non-HOA Participants (2) Hand Grip Strength On A MVC Test

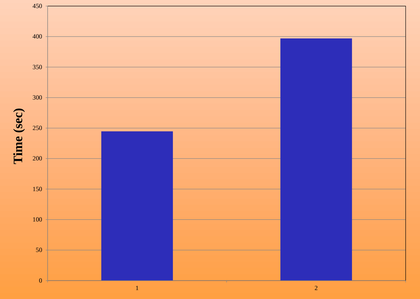


Figure 2: The Averaged Relationship Between HOA Participants (1) And Non-HOA Participants (2) Hand Grip Endurance On An Isometric Hold Test

Results (cont'd)

Variables	Mean Values (±SD)
Age (years)	73.13 (±8.55)
Test 1 MVC:	
Pre-test HR	70.47 (±12.02)
Pre-test BP	129.9/68.87 (±17.36/±10.36)
MVC (kg)	25.57 (±11.09)
MVC RPE (kg)	12.5 (±1.36)
Post-test HR	69.57 (±9.99)
Post-test BP	132.5/69.03 (±16.70/±9.25)
Test 2 (IH):	
Pre-test HR	68.87 (±9.94)
Pre-test BP	126.37/66.8 (±16.70/±9.22)
IH time	320.8 (±156.49)
IH RPE	13.33 (±1.65)
Post-test HR	67.3 (±10.25)
Post-test BP	131.97/68.77 (±18.94/±11.26)

Conclusions

The results of the study showed that HOA does affect hand grip strength and endurance significantly as measured using a hand dynamometer for a MVC and IH test. This study illustrates the weaknesses that hand osteoarthritis causes in older adults. It is recommended that this study be replicated, as this study was limited by time constraints, as well as number of participants. Further studies should examine the effects of hand grip strength and endurance perhaps by the use of tests aside from dynamometer testing.