



Grip Strength and Impact on Cognitive Function in Healthy Kitchen Workers

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ABSTRACT

Background: Hand grip strength is often considered may predict cognitive functioning and has been established as associates of cognitive performance with individual differences in some particular cross-sectional studies. However, little is known about hand grip strength and cognitive performance in the elderly individuals, and it is not known whether changes in hand grip strength may be associated with preservation/decline in cognitive functioning.

Objectives: We have studied the impact of hand grip strength on cognition function in healthy kitchen workers.

Methods: Participants (n = 90, age range: 25–40 years) randomly assigned in to two groups according to their nature of work: Group I-Control group (n = 47) - workers recruited for simple work such as dusting, cleaning dining tables and floor. Group II-Study group (n = 43) - workers recruited for firm work such as cooking large quantity of food, kneading dough, rolling chapattis, cut and sauté the vegetables and dish washing. For the analyses, we used at dominant and non-dominant hand; hand grip strength (HGS), reaction time task, sensory disability test (SDT) and cognitive function test (CFT) among both the groups.

Result: We observed that visual reaction time (VRT) and auditory reaction time (ART) were significantly improved in dominant hand of study group, when compare to control group; however it was comparable in non-dominant hand among both the groups. In addition to; among all control and study group female workers there was significant positive correlation between VRT & ART and significant negative correlation between at dominant hand HGS & VRT as well as between at dominant hand HGS & ART. We also observed that dominant hand HGS was a significant predictor of VRT and ART and however there was no any significant variation in body mass index (BMI), sensory disability test (SDT) and cognitive function test (CFT) among both groups.

Conclusion: We found that muscle strength (as measured by hand grip strength) was associated with improved reaction time. Hence by using a simple muscle strength test; is one way of obtaining useful information for the development of nerve-muscle coordination. Increased handgrip strength would be associated with preservation of cognitive function.

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Introduction

Handgrip strength (HGS) is a noninvasive measure of physical health and usually assessed in different clinical settings as an indicator of over-all health status and upper limb strength (Bonitch-Góngora et al., 2013; Nicolay and Walker, 2005; Schlüssel

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et al., 2008). Some cross-sectional studies have shown associations between muscle strength and physical fitness (Hasegawa et al., 2008; Jeune et al., 2006; Lauretani et al., 2003; Takata et al., 2008). HGS is not only used for muscle strength, but also for changes in biological functioning (Bohannon, 2008). Measures of HGS may be viewed as a general indicator of the integrity of the central nervous system related to cognitive variables (Alfaro-Acha et al., 2006; Raji et al., 2005; Taekema et al., 2010). On the other hand; conflicting results have been reported when data from longitudinal studies have been analyzed to determine whether handgrip strength was a predictor of cognitive decline (Christensen et al., 1999; MacDonald et al., 2004). Although there is substantial evidence that HGS and cognitive performance are associated with individual differences in some particular cross-sectional studies (Anstey and Smith, 1999; Nourhashemi et al., 2002) and longitudinal studies (Clouston et al., 2013; Deary et al., 2011; Kuh et al., 2009).

Most studies are reported on the relations between HGS and mental fitness or cognition in older individuals (Alfaro-Acha et al., 2006; Buchman et al., 2007; Christensen et al., 2000). However, to our knowledge studies reported in young adults are still lacking. Henceforth, the nature of the association between muscle strength and cognition is still uncertain in young adults. The identification of cognitive changes would be of practical benefit, particularly if these were identifiable early in adult life. Thus we hypothesized that change in handgrip strength would be associated with preservation/decline of cognitive function by examining the relationships between both these variables in young adults. So we have studied the impact of hand grip strength on cognition function in healthy kitchen workers.

Methods

Inclusion and Exclusion Criteria for Participants

Varying as a function of age, the highest grip strength scores occur between the ages of 24 and 39 years (Mathiowetz et al., 1985). Hence in our study we have restricted the participant age between 25 and 40 years to evaluate the association with cognition. The participants were female's workers working for more than five years in People's University college kitchen, hospital kitchen and hostels kitchen were recruited for the study. All participants were screened for medications and had no history of respiratory or cardiac diseases. Moreover, there were exclusion criteria for participants such as: self-reported chronic long-term musculoskeletal disease, progressive psychological or neurological disease, diagnosed cardiovascular or metabolic disease with regular medication and pregnant women. The 26 participants were excluded, because of older age, early employment, pregnancy and medical factor.

Ethic Declaration

This cross-sectional and prospective study was approved by the Institutional Review Board of Peoples University and committee of ethics in research involving human participation (PCMS/OD/2015/1069). All participants provided written informed consent to participate. The selected 90 participants who met the inclusion criteria were randomly assigned in to two groups according to their nature of work:

- Group I-Control group (n = 47) - workers recruited for simple work such as dusting, cleaning dining tables and floor.
- Group II- Study group (n = 43) - workers recruited for firm work such as cooking large quantity of food, kneading dough, rolling chapattis, cut and sauté the vegetables and dish washing.

The data were collected under natural environmental conditions in the morning (between 8 am and 12 noon) to avoid diurnal variation.

Study Protocol

Body Mass Index (BMI) Measurements (on the Basis of Asian Population)

This was done in the orthostatic position. Weight and height were measured without shoes and with light clothing. The BMI was calculated by dividing the body weight by the squared height (Klein et al., 2007; Snehalatha et al., 2003).

Determination of HGS

HGS was determined by using Smedley hand grip dynamometer which measures the force exerted in kilograms; as the maximum voluntary contraction (kg) sustained for at least 3 s. Each subject was given the verbal instruction and demonstration before being tested and further instructions are provided at the time of test. Subject stand upright holding the dynamometer in both dominant and non-dominant hand, with the shoulder abducted and elbow in full extension and will be encouraged to exert the maximal grip such as squeeze fingers and thumb together as hard as possible. The participant made six attempts (three with each hand) (Coldham et al., 2006). Three trials with brief pauses of 10–20 s were allowed and the highest score (in kg) was considered as the participant's grip strength score.

Reaction Time Task

This measured time (in milli-sec) responds to right or left light and sound signal with a right or left button press by both dominant and non-dominant hand; as previously explained by our research group (Choudhary et al., 2016). It consisted of two units, a device for stimuli settings and another for stimuli response, along with an electronic chronometer for measuring the reaction time in

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