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Hand Grip Strength and Function in Older Adults

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ABSTRACT

Early recognition of functional decline in older adults is necessary for timely intervention and treatment. Current assessments of function can be cost- and time-consuming, often requiring advanced training of the administrator. Hand grip strength measured through dynamometry may serve as a solution. This mini review explored hand grip strength as a possible predictor for function in older adults. Twenty-one articles were included in this review. There was strong evidence suggesting a correlational relationship between hand grip strength and physical, social, and psychological functioning of older adults. Currently, hand grip strength cutoffs have been investigated for community dwelling older adults as a predictor for physical functional decline requiring intervention. Additionally, the literature reviewed noted differences in hand grip strength between sexes were noted with specific functional implications for both. Future research should focus on establishing meaningful hand grip strength cutoff values to allow for the screening of older adults who may benefit from intervention.

Keywords: Geriatrics, Dynamometry, Activity, Social, Psychological

INTRODUCTION

Between 2015 and 2050, the global proportion of older adults aged 60 years and over will nearly double from 12% to 22% [1]. As older adults progress through life, the effects of medical conditions, disease, and age can impact function [2]. There is a patterned nature to the loss of independence [3]. The most common sequence of regression begins with bathing and ends with eating [4]. As the geriatric population rises, the ability to function independently becomes paramount [5]. The task of preserving independence is often placed on caregivers. The key to effective treatment begins with early recognition of functional decline. Available assessments of independence are often costly, time-consuming, and require advanced training to administer and score. As medical providers navigate the ever-changing landscape of geriatric healthcare, the ability to efficiently screen for functional decline has become paramount. This mini review explored hand grip strength as a possible predictor of function in older adults. Hand grip strength is indicative of overall muscular strength in older adults [6,7]. Hand grip strength declines with age in a predictable and sequential manner similar to functional performance [8]. In the past, function and hand grip strength have been studied independently [9]. Recently, research has shifted to focus on the relationship between the concepts of function and hand grip strength in older adults; however, there is no cumulative evaluation of the recent literature, leaving a gap in knowledge. This mini review addresses the gap by assessing the current research and answering the question, "What is the relationship between hand grip strength and function in older adults"?

REVIEW

This mini review explored the relationship between hand grip strength and function in older adults. Relevant articles were identified by searching Angeline, Google Scholar, PubMed, and Sage Journals through Concordia University's Research Databases. Search terms included various combinations of the following: "hand grip strength," "function," and "older adult". The review of literature was first conducted by the primary investigator and then the secondary investigator independently. Articles mutually agreed upon that met the inclusion criteria were utilized for the review.

Criteria for inclusion in this review were the following:

- articles were original scientific reports of studies

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- articles were focused on the relationship between hand grip strength and function
- studies were categorized as Level 1-3 evidence as based on the Oxford Centre (2009) levels of evidence
- articles were published in English-language peer-reviewed journals
- articles were available in full-text
- articles were published during or after 2009

Criteria for exclusion in this review were the following:

- articles that were dissertations or theses
- articles that did not include hand grip strength or function
- articles that were published in non-English language
- published abstracts
- articles published before 2009

The literature search produced 386 titles which were first scanned for relevance. Fifty-five relevant abstracts were evaluated with 39 being selected and reviewed. After applying inclusion and exclusion criteria, 21 articles were chosen for this mini review. Themes were noted during the critique of articles. The themes were not derived through a specific qualitative methodological approach; rather they were generated based on recurring similarities. As such, articles were categorized into three themes: physical function, social function, and psychological function, and sex.

PHYSICAL FUNCTION

Physical functioning is an umbrella term used to encompass activities such as self-care. These tasks are often synonymous with functional independence. Nine articles explored the relationship between hand grip strength and social functioning of older adults. The majority of research has been conducted on community-dwelling older adults. Seven recent articles focused on community-dwelling older adults and reported a strong correlation between hand grip strength and physical function [10-15]. Specifically, two articles followed up on these findings to determine hand grip strength cutoffs as predictors of function in older adults [11,14]. After assessing hand grip strength and ADL performance of 83 participants, Braun [11] found that hand grip strength <30 kg indicates the need for additional functional tests to identify limitations. Later, Ramírez [14] conducted a cross-sectional study of 5,237 subjects aged 60 years and older. The study first identified sex- and age-specific hand grip strength cutoffs as a determiner of muscle weakness. Second, the study determined cutoff points below these values as predictors of decreased intrinsic capacity (locomotion, vitality, cognition, psychological, and sensory functioning). Two recent articles reported a statistically significant relationship between hand grip strength and functional performance utilized subjects who resided in nursing homes [16,17]. Although the literature suggests a similar relationship between hand grip strength and function for nursing home residents, meaningful cutoffs have not yet been established. Overall, these articles illustrate the relationship between hand grip strength and self-care function in older adults.

SOCIAL FUNCTION

Social functioning is multifaceted [18]. Factors such as physical functioning can impact an older adult's social environments, interaction skills, and social participation [19,20]. Four articles explored the relationship between hand grip strength and social functioning of older adults [21-24]. The literature highlights how internal and external components of social functioning are related to hand grip strength. Two of the articles depict how internal components of social functioning determined the hand grip strength of older adults [21,22]. Frailty, as characterized by weak hand grip strength, correlated with a smaller social network size and in turn an increase in loneliness over time [21]. Being male posed a higher risk of social isolation [22]. Additionally, both studies found low hand grip strength was correlated with older adults who perceived limited emotional support [21,22]. The two remaining articles depicted how external components of social functioning determined the hand grip strength of older adults [23,24]. One study reported social inequalities, such as not owning one's home, were correlated with lower hand grip strength [24]. Whereas the other study demonstrated how social comparisons, such as those made by healthcare professionals, were associated with low hand grip strength [23]. This unique research captured the detrimental effects of social comparison causing significantly worse hand grip strength performance in older adults [23]. Specifically, it was noted that biases made by healthcare providers resulted in lower hand grip strength testing results for older adults [23]. Overall, the four research studies reiterate the complexities of social functioning and demonstrate how internal and external components are related to hand grip strength while illustrating the physical implications of a small network size and social vulnerability for older adults [22-24].

PSYCHOLOGICAL FUNCTION

There are numerous philosophical and psychological theories regarding psychological functioning [25]. For the purposes of this mini review, psychological functioning was narrowed to encompass depression (as a measure of psychological distress) and well-being in congruence with the literature. Hand grip strength can signify physical impairment as well as subjective, psychological dysfunction [26]. Four recent studies of varying methodologies investigated the relationship between psychological functioning and hand grip strength in older adults [27-30].

The literature illustrated the relationship between psychological functioning and hand grip strength in older adults [27-30]. Three studies linked poor hand grip strength and depression in older adults [27,28,30]. Each of the three studies accounted for potentially confounding variables such as sleep quality. After accounting for these factors, it was still concluded that hand grip strength and psychological functioning had a direct, linear correlation [27,28,30]. The fourth article did not investigate depression, instead providing an assessment of hand grip strength, psychological functioning, and performance of activities of daily living [29]. The study noted a strong, complex relationship between the physical and psychological health of older adults [29]. Overall, all four articles were at a consensus that hand grip strength was directly related to the psychological functioning of older adults [27-30]. One article went on to explain the underlying physiology linking hand grip strength and psychological functioning [30]. The article theorized that hand grip strength provided insight into the lateralization of the brain [30]. When investigating hand grip strength and depression, it was found that the degree of lateralization was correlated with depression but not the direction of lateralization [30]. In conclusion, hand grip strength was found to be related with psychological functioning in older adults, but the cause of the relationship is still relatively unknown [27,28,30].

SEX

Males and females are often found to differ in muscular strength with noted differences in muscle fiber size favoring males. This difference is primarily noted in the upper body with less difference noted in lower body strength between sexes [31]. Sex may then be hypothesized to affect hand grip strength and related functioning. Four recent studies of varying methodologies investigated hand grip strength of older adults in relation to function under the context of sex [32-35]. The literature unsurprisingly noted that older adult males had superior hand grip strength when compared to females [33-35]. High hand grip strength was correlated with increased physical functioning, favoring males when compared to females in nearly all categories of physical function [33-35]. Although greater hand grip strength was noted in males, a greater loss in hand grip strength with age was also observed for this sex when compared to females [33,35]. In fact, one study reported that hand grip strength was not correlated with functional loss in females due to age [34]. These three articles were at a consensus that greater hand grip strength in males was associated with greater functioning [33-35]. Males experienced greater loss in hand grip strength and functioning, whereas females noted less loss that may not be correlated with hand grip strength measures [33-35]. Differences between sexes were also found when a study investigated hand grip strength, function, and mortality in older adults [32]. Generally, the study found low hand grip strength was correlated with decreased physical activity and increased mortality for both male and female older adults. Surprisingly, the relationship between lower hand grip strength and higher mortality rates was greater for females, adding complexity to the findings in the aforementioned studies that noted less hand grip strength loss with age in females [32-34]. Overall, these four studies illustrate how sex impacts hand grip strength and physical functioning of older adults. Although hand grip strength impacts both sexes, males and females are affected differently [32-35]. Males may experience greater hand grip strength loss and associated physical functioning decline with age [32-35]. Hand grip strength loss in females may be less but has more severe implications with an increase in mortality rates [32-34].

CONCLUSION

The results of this mini review illustrate the direct, correlational relationship between hand grip strength and function in older adults. In general, there is a strong correlation between hand grip strength and function in older adults [29,30,32]. Based on the established relationship, there are several implications for healthcare providers to consider. First, healthcare providers need to be aware of hand grip strength normative values and the consequences of low hand grip strength for each sex. The provider may then opt to offer the older adult access to interventions to improve muscular strength (e.g., occupational therapy) if significant decreases in hand grip strength are noted. Second, healthcare providers need to be cognizant of social vulnerability of older adults. Recognizing changes in social network size, instrumental support, emotional support, and loneliness is important for proper care and intervention of older adults [21-24]. Finally, older adult patients should be monitored for perceptions of well-being and depression in conjunction with hand grip strength measures. Early detection of declining physical and psychological health may lead to earlier intervention and better outcomes. Overall, the findings from this literature review provide potentially advantageous clinical implications for health care providers and their older adult patients. The evidence synthesized in this review provides a foundation for future research to investigate hand grip strength and function in the older adult population. Additional factors outside of self-care, social functioning, psychological functioning, and sex may also need to be explored by future research as the complexities between hand grip strength and functioning in older adults are identified. Once the phenomenon is better understood, future research may then help to establish guidelines for healthcare providers which will allow these professionals to better care for their older adult patients. For instance, establishing hand grip strength cutoffs as a screening for functional performance may be beneficial. Overall, future research guided by the results of this mini review can improve the clinical application of the literature results, ultimately benefiting older adults.

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