



Short communication

Handgrip strength and its association with functional independence, depressive symptoms and quality of life in older adults



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ABSTRACT

We assessed the associations between handgrip strength and functional independence, quality of life and depressive symptoms in 947 participants aged 65 years or over. Handgrip strength was measured with a dynamometer. Use of formal support and family/friend support was self-reported. Activities of daily living (ADL), quality of life and depressive symptoms were assessed using validated scales. Mean handgrip strength was 27.1 kg (± 10.3). Each 10 kg increase in handgrip strength was associated with 39% reduced odds of impaired instrumental ADL. Handgrip strength was inversely associated with use of both formal and family/friend support. Handgrip strength was independently associated with functional independence.

1. Introduction

Handgrip strength, a simple bedside measure, has been shown to be a proxy for muscle strength [1]. Most of the epidemiological data on the link between handgrip strength and various health outcomes have been primarily assessed in the oldest old age-group. Moreover, the links between handgrip strength and mental wellbeing and quality of life have only been examined in a few cohort studies involving older adults [2,3].

We aimed to evaluate the independent association between handgrip strength and: 1) use of formal and informal support services; 2) activities of daily living (ADL) measures 3) quality of life; and 3) depressive symptoms.

2. Methods

2.1. Study population

The Blue Mountains Eye Study (BMES) is a population-based study of common eye diseases and other health outcomes in a population living west of Sydney, Australia. Study methods and procedures have been described elsewhere [4]. Baseline examinations of 3654 residents aged > 49 years were conducted during 1992–4 (BMES-1, 82.4% participation rate). Surviving baseline participants were invited to attend examinations after 5- (1997–9, BMES-2), 10- (2002–4, BMES-3), and 15 years (2007–9, BMES-4) at which 2334 (75.1% of survivors), 1952 participants (75.6% of survivors) and 1149 (55.4% of survivors) were re-examined, respectively. Handgrip strength measures were collected

at BMES-4; of the 1149 examined 947 had handgrip strength data and included in cross-sectional analysis. The University of Sydney and the Western Sydney Area Human Ethics Committees approved the study, and written informed consent was obtained from all participants.

2.2. Assessment of handgrip strength

Handgrip strength was measured with a Jamar hand dynamometer (Sammons Preston Inc., Bolingbrook, IL). Participants were asked to stand up and hold the dynamometer in the dominant hand with the arm parallel to the body without squeezing the arm against the body. Three trials followed and the best score was used i.e. maximum handgrip strength of the 3 trials.

2.3. Assessment of activities of daily living

The Older American Resources and Services (OARS) ADL scale [5] includes 14 items: seven items assess BADL (e.g., eating), and seven items assess IADL (e.g., housework). Participants reporting that they needed help with any of the activities or were completely unable to perform any of the activities were considered to have impaired ADL.

2.4. Assessment of community support services and informal support

Dependence on community support services was defined as regular use of meals on wheels, homecare or community nursing. Reliance on informal support was defined as receiving assistance from someone other than a spouse (family member/friend) for cleaning or shopping

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Participants' ability to go out alone was also assessed.

2.5. Assessment of depressive symptoms and quality of life

The Center for Epidemiologic Studies Depression Scale (CES-D-10) measures depressive feelings and behaviors experienced during the past week. The 36-Item Short-Form Survey (SF-36) contains 36 items produces eight subscale scores representing dimensions of health and well-being was administered.

2.6. Statistical analysis

SAS statistical software (SAS Institute, Cary, NC, USA) version 9.3 was used for analyses. Maximum handgrip strength was analyzed as a continuous variable (each 10 kg increase). Potential covariates (e.g. demographic factors, chronic conditions) were selected based on published literature and whether these were significant in age-sex adjusted models. Multivariable logistic regression analysis was used to calculate adjusted odds ratios (OR) and 95% confidence intervals (CI) to demonstrate the association between handgrip strength and outcome measures.

3. Results

Mean handgrip strength in the overall cohort was 27.1 kg (± 10.3), and among men and women separately was 35.8 and 20.7 kg, respectively. In men, each year increase in age was associated with 0.72 kg decrease in handgrip strength (unadjusted p -value < 0.0001). In women, each year increase in age was associated with 0.40 kg decrease in handgrip strength (unadjusted p -value < 0.0001).

Each 10 kg increase in handgrip strength was inversely associated with impaired IADL, and with dependence on formal support services and informal support from family/friends (Table 1). Each 10 kg increase in handgrip strength was associated with 59% reduced likelihood of being unable to go out alone (Table 1). Handgrip strength was not associated with depressive symptoms and quality of life (data not shown).

Table 1
Association between handgrip strength and measures of functional independence.

Functional independence	Handgrip strength (each 10 kg increase)	
	Age-sex adjusted OR (95% CI)	Multivariable-adjusted OR (95% CI)
Impaired ADL		
Overall ADL	0.62 (0.41–0.96)	0.69 (0.38–1.24) ^a
Instrumental ADL	0.55 (0.43–0.72)	0.61 (0.45–0.83) ^b
Basic ADL	0.62 (0.45–0.85)	0.77 (0.54–1.11) ^c
Type of support		
Community support services	0.52 (0.36–0.76)	0.54 (0.35–0.84) ^d
Family member/friend support	0.57 (0.42–0.77)	0.60 (0.42–0.85) ^e
Unable to go out alone	0.48 (0.30–0.77)	0.49 (0.25–0.93) ^f

ADL—Activities of daily living; CI—confidence intervals; OR—odds ratio.

^a Further adjusted for living alone, accommodation status, admission to hospitals, poor self-rated health, walking disability, cognitive impairment, and visual impairment.

^b Further adjusted for living alone, poor self-rated health, admission to hospital, chronic kidney disease, walking disability, depressive symptoms and visual impairment.

^c Further adjusted for poor self-rated health, walking disability, fracture, depressive symptoms and use of anti-depressant medication.

^d Further adjusted for receipt of pension payment, living alone, self-rated poor health, walking disability, stroke, chronic kidney disease, and use of anti-depressant medication.

^e Further adjusted for accommodation status, admission to hospitals, poor self-rated health, walking disability, olfactory impairment, and use of anti-depressant medication.

^f Further adjusted for living alone, admission to hospitals, self-rated poor health, walking disability, cognitive impairment, visual impairment and use of anti-depressant medication.

4. Discussion

We observed an inverse association between age and handgrip strength in our participants aged 65+ years, which is in line with prior research showing that decline in grip strength begins in the fifth decade of life [6]. As the muscle mass and function of men is higher than that of women [6], another expected finding was the lower handgrip strength in women. There was a ~ 15 kg difference between genders. This is approximately the same difference reported in the definition of dynapenia (i.e. age-associated loss of muscle strength) [6].

Our findings confirm the predictive association between handgrip strength and IADL disability reported by other studies [7]. Specifically, older adults with reduced handgrip strength had difficulty performing tasks such as shopping for groceries, preparing meals and performing housework. Novel findings from our study include the association between handgrip strength and use of both formal and informal support services. This could be because handgrip strength was associated with IADL disability in our cohort, and previously IADL limitations were shown to be important predictors of need for home help in older people [8]. Our findings of a non-significant association between handgrip strength and depressive symptoms and quality of life might have been due to inadequate study power, and thus, warrants further exploration by other studies with a larger sample size and with a prospective follow-up of study participants.

Strengths of our study include its population-based sample, high participation rates, and collection of comprehensive confounder information. Limitations include the cross-sectional study design which precludes us from causality considerations. We also did not use a standardized procedure for assessing handgrip strength. Finally, we cannot exclude the possibility of residual confounding from unmeasured factors which might have influenced the observed associations.

Our study suggests that preserving handgrip strength is likely to facilitate independent living, as evidenced by the reduced need for both formal and informal support and a greater ability to manage daily living activities with increasing handgrip strength.

Contributors

BG conceived, designed and performed the experiments, analyzed and interpreted the data, and drafted the paper.

AK analyzed and interpreted the data.

GL analyzed and interpreted the data.

PM conceived, designed and performed the experiments, and analyzed and interpreted the data.

Conflict of interest

All authors declare that they have no conflict of interest.

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Ethical approval

The study was approved by the Human Research Ethics Committee of the University of Sydney and was conducted adhering to the tenets of the Declaration of Helsinki. Signed informed consent was obtained from all participants at each examination.

Provenance and peer review

This article has undergone peer review.

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