



# Age Differences in the Relationship of Hand Grip Strength and Depression

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## Abstract

Previous studies have found that grip strength is related to physical health, especially among older adults. We examined whether grip strength was related to mental health in a wider age range of adults, from ages 22 to 84. Grip strength was negatively related to depression when controlling for age, sex, and physical health. This relationship was stronger among younger adults than older adults, and possible explanations for this interaction are discussed.

## Research Question

Is hand grip strength related to depressive symptoms in younger and older adults?

## Background

•Hand grip strength is emerging as an important predictor of cognitive and physical health, including dementia, disability, and mortality, but has been studied primarily in older adults and clinical samples (Auyeung et al., 2008; Bohannon, 2001; Cooper & Hardy, 2010).

•Depression, an important aspect of mental health, has been linked to hand grip strength in a few studies, with inconsistent results. Even less is known about this relationship in young adults, despite the fact that depression is generally more prevalent in early adulthood (Kessler et al., 2010; Tsang et al., 2008).

•We were interested in whether the relationship of grip strength to mental health varied across adulthood.

## Current Study and Hypotheses

•We examined the relationship of hand grip strength and depression, and variations by age. Because past work has shown that sex and health are related to the variables of interest, we included them as covariates.

•We hypothesized that depression would be associated with:

- younger age
- lower grip strength

## Method<sup>1</sup>

### Participants

- Probability sample within 10 mile radius of Waltham, drawn by sampling firm
- Received a letter, then a phone call inviting them to take part in the study
- 138 adults (76 men, 62 women)
- Ages 22 to 84 (M=56.94, SD=15.73)
- Race: Caucasian: 93.50%
- Education: 81.90% bachelor's degree or higher

### Measures

#### At home prior to the lab session:

- Depression – 15-item Geriatric Depression Scale (validated as a measure of affective depressive symptoms for young and older adults) ( $\alpha = .80$ )
- Demographic information – Age, sex, health rating compared to others their own age, on a five point scale from poor to excellent

#### During the lab session:

- Hand grip strength – Grip strength was measured near the end of the two-hour lab session, using a Lafayette Hand Dynamometer model 78010.
  - Three readings on each hand, squeezing as hard as possible each time.
  - The maximum reading for each hand, in kilograms, was used in analyses.
  - The pattern of results was nearly identical for both hands, so we present just the dominant hand findings.

## Results

Variable	Min	Max	M	SD
Geriatric Depression Score	0	14	1.61	2.3
Age	22	84	56.94	15.73
Sex (76 men, 62 women)	---	---	---	---
Grip strength (dominant hand, in kilograms)	16	61	35.45	10.1
Self-rated health	2	5	4.2	0.79

1. The results presented here are a subset of larger project on stress, control beliefs, and cognition, but only the relevant variables for the present study are described here.

## Results (cont'd)

•Analysis: We used a multiple regression analysis to predict depressive symptoms with age, sex, self-rated health, and hand grip strength as independent variables, as well as the interaction of age and grip strength. Sex was coded as -1 for male and 1 for female, and age and grip strength were centered at the mean.

	Depression score	Age	Sex	Grip strength (dominant hand)	Self-rated health
Depression score	1.00	.02	-.19	.12	-.27*
Age	-.25*	1.00	-.03	-.14	-.07
Sex	.05	-.16	1.00	-.70***	.05
Grip strength (dominant hand)	-.23*	-.15	-.81***	1.00	.06
Self-rated health	-.41***	.09	.06	.04	1.00

Note: \* denotes  $p < .05$ , \*\*\* denotes  $p < .001$

■ = age 60 and younger, below the diagonal  
■ = age 61 and older, above the diagonal

Variables	B	SE B	$\beta$
Age	-.057	.012	-.392***
Sex	-.517	.251	-.224*
Grip strength (dominant hand)	-.062	.026	-.274*
Self-rated health	-.996	.208	-.344***
Age x grip strength interaction	.004	.001	.282***

$F(5, 132) = 13.16, p < .001, R^2 = .33$

Note: Correlations are presented separately for younger adults (shown in purple below the diagonal) and older adults (shown in red above the diagonal).



Hand Grip Instrument

Note: \* denotes  $p < .05$ , \*\*\* denotes  $p < .001$ . Younger age and lower grip strength significantly predicted higher depression scores, as hypothesized, as did poorer self-rated health. Unexpectedly, male sex was related to higher depression scores. There was a significant interaction of age and hand grip strength. See Figure 1.

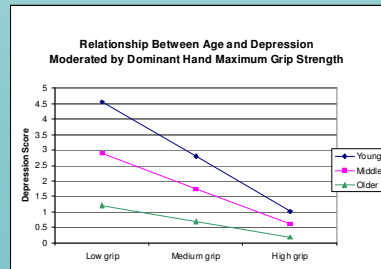


Figure 1:  
Note: The middle age group and medium grip strength represent the mean for each measure. Young and older as well as low and high grip represent minus and plus one standard deviation from the mean, respectively. Greater hand grip strength is associated with lower depression for all age groups; however, this relationship is stronger for younger adults. Younger adults usually have higher levels of depression than older adults do (Kessler et al., 2010; Tsang et al., 2008), but this relationship is moderated for those young people with higher grip strength.

## Discussion

### Summary

- As predicted, age and grip strength were both negatively related to depression.
- However, this was qualified by an interaction with age.
  - Younger adults: Higher grip strength associated with lower depression score
  - Older adults: Grip strength and depression not as strongly related
- Interaction: Among younger adults, those with higher grip strength have lower depression levels more comparable to older adults.

### Conclusions

- Why is the relationship between hand grip strength and depressive symptoms weaker in older adults?
  - It may be because mental health and physical health are less interdependent among the elderly. (See correlations, Table 2.)
  - Positivity effect (preference for positive information in attention and memory (Carstensen et al., 1999).
  - May be more able to accept physical declines, which are a normal part of aging, without as much impact to their well-being (Kessler et al., 2010).
  - Geriatric Depression Scale excludes somatic symptoms of depression (Sheikh & Yesavage, 1986). With a scale addressing the physical symptoms of depression we may have found a stronger link between depression and grip strength among the elderly.

### Depression and Sex

One interesting and unexpected finding in our data is that male sex, not female, was related to higher depression scores. Past work (e.g., Barefoot et al., 2001) has found that among the elderly, women are not always more depressed than men. It seems important when considering gender differences in depression to consider age differences as well.

## Future Directions

- The findings suggest that hand grip strength is related to mental health among young people. However, directionality of this relationship is not clear.
  - Physical weakness may impact the sense of well-being
  - Or depression may reduce motivation or ability to exert a strong grip
  - Or there may be a common underlying cause
- Future work on grip strength and depression should continue to consider age differences as well as differences among depression inventories.
- Intervention studies should continue to look at resistance training along with aerobic exercise to examine the effect on depression, as in Rethorst et al. (2009).