

# Hand grip strength is associated with fatigue in COPD

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## Background

Hand grip strength (HGS)<sup>1</sup> and fatigue<sup>2</sup> are both related to the burden of disease in COPD, but the relationship between HGS and fatigue among subjects with COPD is unknown.

## Aims

To evaluate the relationship between HGS and fatigue among subjects with and without COPD in a population based study.

## Methods

A COPD sample has, together with age- and sex-matched referents without COPD, been followed annually since 2005 in the OLIN COPD study. In 2014, 304 subjects with and 362 subjects without COPD were clinically examined including interviews, spirometry, HGS and the FACIT-Fatigue questionnaire (0-52, lower scores represent increased fatigue). HGS was measured by a hand held dynamometer, Jamar<sup>®</sup>. Clinically relevant fatigue (CRF) was defined as FACIT-Fatigue score  $\leq 43$ . COPD was defined as post-bronchodilator FEV<sub>1</sub>/VC <0.70, and assessment of disease severity was based on FEV<sub>1</sub> % of predicted, using the OLIN reference values for FEV<sub>1</sub><sup>4</sup>. All analyses were stratified by sex.

**Table 1. Study population, basic characteristics, comparing non-COPD and COPD among women and men, respectively.**

	Women			Men		
	Non-COPD n=198	COPD n=164	p-value	Non-COPD n=239	COPD n=217	p-value
Age, mean (SD)	70.3 (9.8)	72.8 (8.7)	<b>0.011</b>	70.1 (9.0)	71.6 (9.0)	0.083
Smoker, n (%)	17 (8.6)	29 (17.7)		10 (4.2)	45 (20.5)	
Ex smoker, n (%)	71 (35.9)	75 (45.7)		122 (51.0)	116 (53.5)	
Non smoker, n (%)	110 (55.6)	60 (36.6)	<b>&lt;0.001</b>	107 (44.8)	56 (25.8)	<b>&lt;0.001</b>
Height, mean (SD)	160.3 (6.7)	159.8 (6.6)	0.460	173.8 (7.1)	174.3 (6.7)	0.425
BMI, kg/m <sup>2</sup> , mean (SD)	27.8 (4.73)	26.6 (4.6)	<b>0.015</b>	27.4 (3.7)	26.9 (4.0)	0.111
FEV <sub>1</sub> % pred, mean (SD)	99.4 (14.0)	81.2 (15.9)	<b>&lt;0.001</b>	95.1 (13.4)	76.5 (17.5)	<b>&lt;0.001</b>
Respiratory symptoms <sup>1</sup> , n(%)	77 (38.9)	97 (59.1)	<b>&lt;0.001</b>	105 (44.9)	147 (67.7)	<b>&lt;0.001</b>
Heart disease <sup>2</sup> , n (%)	18 (9.1)	21 (12.8)	0.225	46 (19.2)	51 (23.5)	0.296
HGS, mean (SD)	24.6 (6.8)	22.8 (5.5)	<b>0.008</b>	43.3 (9.6)	41.1 (9.5)	<b>0.013</b>

<sup>1</sup>Respiratory symptoms: self-reported history of at least one of; modified Medical Research Council dyspnea scale  $\geq 2$ , chronic cough, chronic productive cough or recurrent wheeze. <sup>2</sup>Heart disease: self-reported history of at least one of; angina pectoris, myocardial infarction, cardiac insufficiency, coronary artery bypass or Percutaneous Coronary Intervention procedure. Abbreviations: BMI, Body Mass Index; HGS, Hand grip strength; FEV<sub>1</sub>% pred, Forced expiratory volume in one second percent of predicted; SD, Standard deviation

## Conclusions

- Hand grip strength was associated with fatigue among subjects with, but not without COPD.
- Among men with COPD, the association between hand grip strength and fatigue remained significant also when adjusted for confounders.

**Table 2. Comparing mean HGS (SD) among individuals with and without clinically relevant fatigue (CRF) in COPD and non-COPD, among women and men, respectively.**

	Non-COPD n=194		COPD n=152		p-value <sup>a</sup>
	Mean HGS (SD)	Mean HGS (SD)	Mean HGS (SD)	Mean HGS (SD)	
<b>Women</b>					
Non-CRF	25.1 (6.5)	23.7 (5.0)			0.054
CRF	23.2 (7.2)	21.9 (5.9)			0.323
p-value	0.069 <sup>b</sup>	0.051 <sup>c</sup>			
<b>Men</b>					
Non-CRF	44.2 (9.5)	43.1 (8.7)			0.313
CRF	42.0 (9.2)	38.6 (9.7)			<b>0.035</b>
p-value	0.114 <sup>b</sup>	<b>0.001<sup>c</sup></b>			

<sup>a</sup>Comparing mean HGS between non-COPD and COPD. <sup>b</sup>Comparing mean HGS between non-CRF and CRF in non-COPD. <sup>c</sup>Comparing mean HGS between non-CRF and CRF in COPD. Including all individuals with complete data on HGS and FACIT-Fatigue, n=785 (Figure 1). CRF is defined as a FACIT-Fatigue score of  $\leq 43$ . Abbreviations: HGS, Hand grip strength; CRF, Clinically relevant fatigue; SD, standard deviation

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## References

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## Results

Basic characteristics of the study population are shown in Table 1. Among individuals with COPD those with CRF had lower mean HGS than those without CRF, significantly so among men and close to among women (Table 2). HGS was non-significantly higher among those with compared to those without CRF in non-COPD.

Among individuals with COPD, HGS remained associated with fatigue among men, but not among women, when adjusted for age, height and smoking habits (Table 3). HGS was associated with fatigue, both when assessed as a continuous FACIT-fatigue score as well as when assessed as CRF. The corresponding analyses among subjects without COPD yielded no significant results.

**Table 3. Multiple linear regression model analyzing the association between HGS and fatigue, assessed both as a continuous FACIT-fatigue score and as clinically relevant fatigue (CRF, defined as FACIT-Fatigue  $\leq 43$ ) among subjects with and without COPD, analyses stratified for sex.**

	Non-COPD n=194			COPD n=152		
	B	95% CI		B	95% CI	
<b>Women</b>						
FACIT-fatigue score	0.062	-0.048 0.172		0.085	-0.001 0.171	
CRF	-0.961	-2.767 0.845		-0.924	-2.557 0.708	
<b>Men</b>						
FACIT-fatigue score	0.115	-0.019 0.250		<b>0.249</b>	<b>0.131</b>	<b>0.367</b>
CRF	-0.944	-3.086 1.198		<b>-2.658</b>	<b>-4.612</b>	<b>-0.703</b>

All analyses are adjusted for age, smoking habits and height. CRF is defined as a FACIT-Fatigue score of  $\leq 43$ . Abbreviations: B, Beta coefficient; HGS, Hand Grip Strength; CRF, Clinically relevant fatigue

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