COPD-PASS;

Physical Activity in COPD patients: the role of perceived Social Support

A cross-sectional study.

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Abstract

***Title**:* COPD-PASS; Physical Activity in COPD patients: the role of perceived Social Support.

***Background**:* Chronic obstructive pulmonary disease (COPD) is one of the leading causes of mortality worldwide. Patients endure physical symptoms that can result in reduced physical activity and might induce psycho-social distress. Meanwhile both physical activity and social support can have positive influences on COPD progression and patient's well-being. It seems plausible that there is an association between physical activity and social support, however existing evidence is poor.

***Aim**:* To examine the association between perceived social support and the perceived limitation of physical activity in patients with COPD.

***Method**:* A cross-sectional multi-center study was conducted among Dutch outpatient COPD patients between January and May 2019. Perceived social support was assessed with the short version of the 'Social Support List of Interactions' and perceived limitation of physical activity was measured with the 'Clinical COPD Questionnaire'. A multiple regression analyses was performed to assess the association between social support and physical activity. Analyses were adjusted for dyspnoea (assessed with the MRC-dyspnoea scale), age and gender.

***Results**:* 53 participants (79.2% GOLD IV; 52.8% male; mean age 66.8 years (*SD*=11.9)). The mean score for social support was 29.40 (range 12-48) and for physical activity it was 3.96 (range 1-7). After statistical adjustment for dyspnoea, age and gender, perceived social support was not significantly associated with perceived limitation of physical activity (β=.012; *p*=.580).

***Conclusion**:* No significant association was found between perceived social support and perceived limitation of physical activity in COPD patients.

***Recommendations**:* It might be useful to investigate other aspects of a possible association between social support and physical activity, since both social support as physical activity have more facets than the 'perceived social support in general' and 'perceived limitation of physical activity', studied in this research.

***Keywords**:* Chronic obstructive pulmonary disease, Social Support, Physical Activity, Physical Fitness

Samenvatting

***Titel**:* COPD-PASS; Fysieke activiteit van COPD-patiënten: de rol van ervaren sociale steun.

***Achtergrond**:* Chronische obstructieve longziekte (COPD) is een van de meest voorkomende ziekten wereldwijd. Symptomen van COPD leiden bij de patiënt tot verminderde fysieke activiteiten en kunnen psychosociale stress veroorzaken. Tegelijkertijd kunnen fysieke activiteit en sociale steun juist een positieve invloed hebben op het ziekteverloop en het welbevinden van COPD-patiënten. Het lijkt aannemelijk dat er een verband is tussen fysieke activiteit en sociale steun, maar het bewijs daarvoor is beperkt.

***Doel**:* Het onderzoeken van een mogelijke relatie tussen ervaren sociale steun en ervaren beperking in fysieke activiteit bij COPD-patiënten.

***Methode**:* Dit cross-sectionele onderzoek is tussen januari en mei 2019 uitgevoerd onder poliklinische COPD-patiënten van twee Nederlandse ziekenhuizen. Ervaren sociale steun is gemeten met de korte versie van de 'Sociale Steun Lijst'. Ervaren beperking in fysieke activiteit is gemeten met de 'klinische COPD vragenlijst (CCQ)'. Een multiple regressievergelijking is als analyse uitgevoerd, waarbij gecorrigeerd is voor dyspneu (gemeten met de MRC-dyspneu lijst), leeftijd en geslacht.

***Resultaten**:* 53 participanten (79.2% GOLD IV; 52.8% man; gemiddelde leeftijd 66.8 jaar (*SD* = 11.9)). De gemiddelde score voor ervaren sociale steun was 29.40 (range 12-48) en 3.96 (range 1-7) voor ervaren beperking in fysieke activiteit. Met de correctie voor confounders (dyspneu, leeftijd en geslacht) is er geen significant verband tussen sociale steun en fysieke activiteit gevonden (β=.012; *p* =.580).

***Conclusie**:* Er geen significant verband gevonden tussen ervaren sociale steun en ervaren beperking in fysieke activiteit in COPD-patiënten.

***Aanbevelingen**:* Het kan zinvol zijn om andere aspecten van een mogelijk verband tussen sociale steun en fysieke activiteit te onderzoeken, aangezien zowel sociale steun als fysieke activiteit meer facetten in zich hebben dan 'de ervaren sociale steun in het algemeen' en 'de ervaren beperking in fysieke activiteit', die in dit onderzoek zijn onderzocht.

***Kernwoorden**:* COPD, Sociale Steun, Fysieke Activiteit, Fysieke Fitheid.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of mortality and morbidity worldwide[1,2]. Almost three million people died of COPD in 2016 which is a significant increase compared to 2006[1]. COPD is characterized by an abnormal inflammatory response in the lungs, airflow limitation and ongoing respiratory manifestations[3,4]. This causes symptoms such as dyspnoea, chronic cough, sputum production, wheezing, chest tightness and skeletal muscle wasting[3,5–11]. COPD is also associated with reduced health-related quality of life and overall health status[6,12,13]. According to multiple studies, the disease pathology and symptoms of COPD lead to reduced functional capacity and lower levels of functional performance like physical activities (PA)[4,6,14–16].

PA is defined by the World Health Organization (WHO) as:

> *'Any bodily movement produced by skeletal muscles that requires energy expenditure. … Physical activity includes exercise as well as other activities which involve bodily movement and are done as part of playing, working, active transportation, house chores and recreational activities.'*[17]

It is well known that COPD symptoms influence PA[4,6,14–16]. However, several reviews stated that the amount of PA influences the disease pathology and symptoms as well[14,16,18]. Increased PA is beneficial for lowering COPD symptoms and improving physical fitness. For example, higher amounts of PA are associated with lower levels of airway obstruction, systemic inflammation, hospitalization and mortality[14,19,20]. In the initial phase of COPD the amount of PA is comparable to healthy peers without COPD[21]. However, a reduced health status is already reported regarding dyspnoea, fatigue and functional limitations[21]. As COPD worsens the physical limitations and symptoms, such as dyspnoea increase[15], which results in significantly less PA in COPD patients[13–15,22]. Despite their physical limitations and lower levels of PA, COPD patients appreciate PA. In an integrative review and exploratory study, COPD patients reported that they enjoyed PA and that it contributed to their social role[10,23].

In general, COPD patients consider activities that contribute to their satisfaction and social life as meaningful[16,23]. Besides the COPD patients' view, it is also proven that a good functioning social life is beneficial for a range of health outcomes[13]. For example, a meta-analytic review demonstrated that adequate social relationships contribute to a 50% lower mortality rate in the general population compared to insufficient social relationships[24]. Moreover, a scoping review about COPD declared a beneficial effect of social support (SS) on cardiovascular diseases[13].

SS is an important aspect of social relationships and refers to emotional, informational or material resources provided by others to help an individual to cope with stress[10,13,25,26]. In COPD patients SS is beneficial for mental health and self-efficacy outcomes[13]. An integrative review showed that SS can be a strong motivator and help patients to develop coping skills to manage their life with COPD[10]. On the other hand, the same review also found that COPD negatively impacted the social roles of patients. Due to the physical limitations and feelings of embarrassment, caused by the visible symptoms of their illness and treatment, COPD patients are impeded in their ability to socialize. This places them at risk of social isolation[10,23].

As described above, PA and SS are considered independent influential factors on the progression of COPD and patient's well-being. In addition, there might be reasons to assume an association between PA and SS in COPD patients, since PA contributes positively to a patients social life[10,16,23] and a healthy social life can be beneficial on physical outcomes[13,24,27]. However, evidence with regard to the association between PA and SS is scarce, because the possible association between SS and PA was not the main focus of the studies and therefore the association has only been studied to a limited extent[10,13,16,23,24,27]. In our study the focus was on how COPD patients perceived SS and (limitation of) PA and the possible association between those factors, therefore making a contribution to the existing body of knowledge on this subject. A better understanding of factors influencing life with COPD contributes to development of the best possible care for COPD patients.

Aim

The aim of this study is to examine the association between perceived social support and the perceived limitation of physical activity in patients with COPD.

Method

Study design

A cross-sectional design was used to examine the association between perceived SS and the perceived limitation of PA in patients with COPD, because time or causality were not of interest in the objective of this study[28]. In order to compare the outcomes and to be able to make a statement about the significance of the association, a quantitative design has been chosen[28]. Patient reported outcome measures (PROMs) are used to quantify the parameters.

Population and setting

This study is conducted in the outpatient clinic for pulmonary diseases of an academic- and a peripheral hospital in the Netherlands, between January 30th and May 23th 2019. Because of feasibility reasons, a convenience sample was chosen[28].

This study focused on outpatient COPD patients who met the following inclusion criteria; 1) diagnosed with COPD by a physician, and 2) being able to read and understand the Dutch language.

To optimize the generalizability of the results, there were no restrictions regarding age, gender or GOLD-grade. A GOLD-grade is a classification of airflow limitation severity in COPD based on spirometry, according to the guidelines of the Global initiative for chronic Obstructive Lung Disease (GOLD)[3]. GOLD-grades go from 'mild COPD' (GOLD I) to 'very severe COPD' (GOLD IV)[3].

COPD patients with a severe life-threatening comorbidity were excluded because those comorbidities and associated symptoms might impact the SS and/or PA more than the COPD.

Procedures

The healthcare provider (i.e. physician or respiratory nurse (RN)) assessed whether patients were suitable for inclusion. At the end of their consultation, the healthcare providers informed eligible patients about the possibility to participate in this study. The physician referred eligible patients, who were interested to participate, to the researcher (MD). The researcher (MD) or RN informed potential participants about the aim, the kind of information that would be gathered through questionnaires (i.e. PROMs) and from the patient file, what was expected of the patient, the Informed consent (IC) procedure and that participation was voluntary. This information was provided both verbally and in an information letter. If the participant agreed to participate he/she was asked to sign an IC-form. It was explicitly stated that the patient could, at any time, withdraw from the study by contacting the researcher and/or not returning the questionnaires. No information was extracted from the patient file in case no questionnaire was returned. Patients were also offered the option to sign the IC at home and send it back with the questionnaires. Patients were asked for their permission and phone number to give them a reminder phone call if the questionnaires were not returned within two weeks. Patients received a copy of the information letter and IC form, so they could read over the information that was

provided at home. They also received the questionnaires and a stamped envelope. Patients were asked to fill out the questionnaires at home, or immediately at the OCPS if they preferred, and send it back.

Sample size

The number of patients needed to obtain sufficient statistical power to draw conclusions was based on the number of study parameters[29–31]. This study contained five parameters (i.e. PA, SS, dyspnoea, age and gender). Within epidemiological studies it is common to aim for at least 10 participants per study parameter[29–31]. A sample size of 10 participants per parameter is also appropriate for a multiple regression analysis[32,33], which was intended for the statistical analysis in this study.

Data collection

Patient characteristics

Patient characteristics were collected about: last reported lung function parameters (FEV1 and FVC), age, height, weight, gender, marital status and educational level. Most characteristics were retrieved from the patient's files, since it seemed likely that patients would not know all their exact values and to keep the questionnaire about patient characteristics as short as possible for participants. Marital status and educational level were asked in a questionnaire.

Social support

The amount of perceived SS was assessed with a PROM; the social support list of interactions (SSL12-I), in Dutch: sociale steun lijst 12 – interactie[25,34,35]. The SSL12-I is a shortened version of the Social support list-interactions (SSL-I)[25,34,35]. The SSL12-I consists of 12 questions[34,35]. Each question could be answered on a scale ranging from 1 ('seldom or never') to 4 ('very often')[34,35]. Higher scores indicated more perceived SS[34,35].

The SSL12-I is validated in the elderly population and has a 0.87 Cronbach's alpha[34,35]. The construct validity has a Pearson's-product-moment correlation of 0.46 compared with the social provisions scale and -0.44 compared with the Loneliness scale[34,35].

Physical Activity

The perceived limitation of PA was also assessed with a PROM; the Clinical COPD questionnaire (CCQ)[36–39]. The CCQ is a 10-item questionnaire to measure health status in patients with COPD and contains three domains: symptoms, mental state and functional state[36–39]. In this study only the four questions concerning the functional state domain were used in the analyses. Each question was scored on a scale ranging from 1 ('never') to 7 ('always')[36–39]. Higher scores indicated increased limitation of PA[36–39].

The internal consistency of the 'functional state' domain of the CCQ has a 0.89 Cronbach's alpha[36]. It also has a strong correlation ($\rho = 0.69$; $p < 0.01$) with the activity component of the St George respiratory questionnaire (SGRQ), indicating a good convergent construct validity[36].

Dyspnoea

Dyspnoea is negatively associated with perceived SS and positively associated with perceived limitation in PA[40–42]. Therefore dyspnoea was considered a possible confounder in this study and was assessed with the MRC dyspnoea scale[36–39,43]. The scale consists of six statements increasing in severity of perceived breathlessness[43]. Patients had to select one statement that applied to them most[43]. A higher score indicates more severe dyspnoea[43]. The MRC dyspnoea scale is a simple and valid method to categorize COPD patients in terms of their disability due to dyspnoea[43]

Age and gender

Also aging is negatively related to perceived SS and positively associated with limitation of PA[44–46]. Being female is positively associated with both perceived SS and limitations in PA[45–48]. Therefore, age and gender were considered possible confounders and were inventoried as part of the patient characteristics.

Data analysis

Descriptive statistics were used to describe the sample[32,33,49].

A multiple regression analyses, adjusted for the possible confounder's dyspnea, age and gender was applied to quantify the association between perceived SS and perceived limitation of PA. Several statistical steps preceded this multiple regression analysis.

First the parameter scores of perceived SS and perceived limitation of PA were calculated for each individual participant. For perceived SS the parameter score was the sum of the provided scores for the questions of the SSL-12-I[25,34,35,50]. For perceived limitation of PA it was the mean of the provided scores for the questions in the functional state domain of the CCQ[37]. Per variable a maximum of one missing answer was permitted to calculate the parameter score. For the perceived SS the one missing variable was replaced with the mean of the remaining scores of the SSL-12-I questions.

The second step was to check the assumptions for regression analyses regarding normal distribution of the parameter-scores for normality and linearity[32,49].

Next several separate analyses with the parameter-scores and the confounders were conducted in order to understand the influence of the possible confounders. The first analysis was a univariate regression with perceived SS as predictor and perceived limitation of PA as outcome variable (model 1). Secondly, three independent multiple regression analyses were executed, in which each time one confounder (i.e. dyspnoea, age or gender) was combined with perceived SS and perceived limitation of PA (model 2a, 2b and 2c). Finally, the multiple regression analysis with all variables and confounders was performed (model 3).

In this study statistical outcomes were considered significant if $p \leq 0.05$. All statistical testing was performed with IBM SPSS Statistics version 25.0 (Armonk, New York, USA).

Ethical issues

The study is conducted according to the principles of the Declaration of Helsinki (Version 8, 2013)[51]. The medical research ethics committee (MREC) of the University Medical Center Utrecht concluded that 'medical research involving human subjects', (in Dutch the WMO)[52] does not apply to this study. A waiver of WMO approval was granted by the MREC in December 2018.

Results

Participants

In this study 55 patients received the questionnaires. Two persons withdrew from the study by not returning the questionnaire and IC-form, leading to a total of 53 participating patients. The patient characteristics are presented in Table 1.

Most participants had GOLD grade IV (79.2%). The mean age of the sample was 66.8 years (*SD* = 11.9). In the study sample 52.8% of the patients were male and 50.9% of the sample was married or cohabiting. Two participants received care in a peripheral hospital and 51 in an academic hospital.

The means, standard deviations and range of SS, PA and dyspnoea parameter scores are presented in Table 2.

Regression analyses

Assumptions

The perceived SS and perceived limitation of PA parameter scores were checked for the assumptions of normality and linearity. Kolmogorov-Smirnov test of normality showed no significant deviation from normality for SS or PA (p_{SS} = .200 and p_{PA} = .139). Thereafter the regression analyses were conducted. (Table 3)

Association between perceived SS and perceived limitation of PA

The first model, a univariate linear regression analyses, showed no significant association between perceived SS as predictor and perceived limitation of PA as outcome variable (β = .007; *p* = .772).

In the second model, three separate multiple regression analyses were conducted. In each analysis the predictor perceived SS was corrected for one confounder; dyspnoea, age or gender. None of those analyses showed a significant association between perceived SS and perceived limitation of PA. The regression coefficients of perceived SS were β = .009 (*p* = .624) when corrected for dyspnoea (model 2a), β = .015 (*p* = .537) when corrected for age (model 2b) and with a correction for gender, perceived SS had a regression coefficient of β = .005 (*p* = .841) (model 2c).

In the third model, one multiple regression analysis was conducted in which perceived SS was corrected for all three confounders at once. Corrected for dyspnoea, age and gender at the same time, perceived SS was also not significantly associated with perceived limitation of PA (β = .012; *p* = .580).

Association between confounders and perceived limitation of PA

Model 2a showed a significant positive association between the outcome variable PA and the confounder dyspnoea, corrected for perceived SS (β = .691; *p* < .000). The other confounders (i.e. age and gender) showed, corrected for perceived SS, no significant association with perceived limitation of PA.

The third model, in which all variables were combined, showed also a significant association between dyspnoea and PA (β = .650, ρ < .000) and not for the other confounders.

Missing data

The patient file-data of five patients was missing. Three of these patients returned their questionnaires without providing permission for data collection from the patient file. The required permission couldn't be obtained later on. The file-data of the other two patients belonged to the peripheral hospital and couldn't be obtained due to unforeseen circumstances.

In four questionnaires a question of the SSL-12-I or CCQ was answered ambiguously, due to multiple or blank answer options. Therefore, those answers were considered as missing. Since it concerned no more than one question per questionnaire the SS- or PA parameter score of those participants could still be calculated. So, there were no missing data in the parameter-scores in this study.

Discussion

In this study the association is examined between perceived social support and perceived limitation of physical activity among COPD patients. Although multivariate models with correction for confounders were used, this study shows no significant association between perceived social support and perceived limitation of physical activity. This means that we could not show that COPD patients with more perceived social support experience more (or less)

ease in performing daily activities. Nor could we confirm that patients who feel more limited in activities experience more (or less) social support.

The results of our study are not in line with multiple studies among different populations that did also examined the association between SS and PA[53–58]. Those studies reported a positive association between SS and PA, meaning that an increase of SS is related to an increase of PA[53–58]. In our study, among COPD patients, this association could not be confirmed.

This could be explained by the difference in study populations. The studies that did find an association were conducted among knee and hip osteoarthritis patients[53], cancer survivors[54], elderly[55,56], adolescent asthma patients[57] and COPD patients (the mean GOLD classification of this study population was lower (i.e. GOLD III)[58] than in our study). In our study most patients had a GOLD IV classification, meaning the participants were diagnosed with very severe COPD, which is common for a hospital setting[59]. Severe COPD symptoms like chronic cough, sputum production and skeletal muscle wasting[3,5–11] might have such a restrictive influence on the ability to perform PA that SS might no longer be of any influence anymore. Therefore it might be possible that SS and PA are associated in patients with less severe respiratory symptoms, like adolescent asthma patients[57] or COPD patients with GOLD I-III[58], but not anymore in patients with very severe respiratory symptoms (i.e. GOLD IV). Meaning that it might be possible that our study findings are representative of the GOLD IV population.

Another explanation could be the different ways constructs SS and PA were measured. In former studies SS was measured as marital status or number of close friends and relatives instead of how the SS was perceived[53–56,58]. It is possible that marital status or number of close friends and relatives are no indicator for how SS is perceived by the participant. For example; someone who is living with a partner and having a lot of family can still feel unsupported, while someone with one good friend but no family can feel much supported. The one study that did measure perceived SS used a different questionnaire* than we did in our study[57]. Also, PA was assessed differently in the former studies than in our study. The studies assessed the amount of PA, mainly using an accelerometer or other kind of monitor, and not the perceived limitation in PA[53–58]. In our study the focus was on how COPD patients perceived the (limitation in) PA, therefore the use of PROMs was more appropriate than an accelerometer. It could be possible

* Title of this questionnaire is unknown.

that the amount of PA is associated with SS, but that the perceived limitation in PA is not (e.g. someone who walks a lot can still feel very limited in the performance of the PA, or someone who does not feel limited at all shows sedentary behavior).

To interpret the findings of this study, some limitations need to be considered. Firstly, the focus of our study was on how COPD patients perceived their SS and limitation in PA and was measured with PROMs. It might be questioned if a qualitative interview wouldn't be preferable to assess subjective variables as the perceived SS and limitation in PA. However, the use of PROMs made it possible to quantify the association and make a statement about the significance of it. Therefore, the use of quantitative PROMs was the most preferable for the aim of this study.

Secondly, it could be questioned if smoking-status should have been analyzed. Smoking status of the participants was not assessed, to optimize the generalizability of the study. Smoking is a well-known cause of COPD[3,60–62] and it is likely that part of COPD patients still smoke tobacco. It is often argued that, if a COPD patient does not quit smoking, he or she might be unmotivated to engage in other healthy behaviors, like more PA as well. However, smoking is an addiction disease[63–65]. Therefore, an individual might be motivated to conduct all kinds of healthy behaviors and at the same time be unable to quit smoking. And because smoking is an addictive disease[63–65], it can be considered as a comorbidity, which was no exclusion criteria in this study in order to optimize the generalizability of the study outcome.

Thirdly, the multi-center setting with both a peripheral and academic hospital should contribute to the generalizability of this study to COPD patients in the outpatient clinic population. However, due to unfortunate circumstances the collaboration with the peripheral hospital was limited and provided only 2 of the 53 participants.

Fourthly, some participants did fill out the questionnaires in the presence of a friend or relative. It could be possible this influenced the answers given by the participant.

Fifthly, this study might be biased due to the influence of the flu epidemic in the Netherlands during the first few weeks the data collection[66]. Participants who had flu symptoms in the week before filling out the questionnaires would most likely score higher on perceived limitations of

PA than participants who did not have flu symptoms in the week before filling out the questionnaires.

Strengths of this study are that inclusion bias is limited. The healthcare providers who included the participants in the study had no conflict of interest. In addition to improve the quality of this study, the entering of questionnaire answers in the computer was checked by a second person. In addition, this study was reported according to the “Strengthening the reporting of observational studies in epidemiology (STROBE) checklist” for reporting observational cross-sectional studies[67].

Even though this study showed no significant association between SS and PA, these factors are independently still important for the well-being of the COPD patient[10,13,16,23,68]. Therefore, it is still meaningful to stimulate the SS of COPD patients and also motivate patients to be physically active. Since our study focused on SS in general, it might also be interesting to investigate the influence of SS in which promotion of PA is an explicit focus area.

Conclusion

No significant association between perceived SS and limitation of PA in patients with COPD was found in this study. However, it might be useful to investigate other aspects of a possible association between SS and PA, since SS and PA have more aspects than the perceived SS in general and perceived limitation of PA studied in this research.

Disclosure statement

The authors report no conflicts of interest.

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Tables & Figures

Table 1.

Patient Characteristics

	Participants (*n* = 53)
Gender	
Male	28 (52.8%)
Female	20 (37.7%)
Missing	5 (9.4%)
Age (years) Missing n = 5 (9.4%)	66.8 (*SD* 11.9)
BMI (kg/m^2) Missing n = 5 (9.4%)	24.3 (*SD* 5.1)
GOLD Grade (%)	
0[a]	6 (11,3%)
I	0
II	0
III	0
IV	42 (79,2%)
Missing	5 (9.4%)
FEV_1 (liters) Missing n = 5 (9.4%)	1.61 (*SD* 0.6)
FEV_1 pred (%) Missing n = 5 (9.4%)	*73.7 (Q1= 64.0; Q3= 77.0)*
Education level[b]	
Low	25 (47.2%)
Medium	19 (35.8%)
high	9 (17.0 %)
Marital Status	
Married ***/*** cohabiting	27 (50,9%)
Widowed	8 (15,1%)
Divorced	5 (9.4%)
Single	11 (20.8%)
Other	2 (3.8%)

Note. Categorical variables are presented in number of participants (percentages). Continuous variables are presented as mean (standard deviation) or, in italics, median (interquartile range).

n = number of participants; BMI = body mass index; GOLD = Global Initiative for Chronic Obstructive Pulmonary Disease; FEV_1 = forced expiratory volume in 1 second;

[a] Gold 0 doesn't officially exist, but could be caused by an inaccurate spirometry test[3].

[b] Categories are based on the Standaard OnderwijsIndeling 2016, edition 2017/'18 (SOI)[69]

Table 2.

Parameter scores of social support, physical activity and dyspnoea of the sample (*n* = 53)

	Mean (*SD*)	**Range**	**Ref Range**
SS	29.40 (8.43)	12-48	12-48
PA	3.96 (1.38)	1-7	1-7
MRC dyspnoea	2.70 (1.25)	0-5	0-5

Note. n = number of participants; SS = social support; PA = physical activity; MRC dyspnea = medical research council dyspnea scale.

Table 3.

Regression model of social support and physical activity in COPD patients. (*n* = 53)

	R^2	β	95% CI	*P*
Model 1.	.002			
SS		.007	[-.039, .052]	.772
Model 2a.	.396			
SS		.009	[-.027, .045]	.624
Dyspnoea		.691	[.448, .934]	<.000
Model 2b.	.011			
SS		.015	[-.034, .065]	.537
Age		-.006	[-.041, .028]	.714
Model 2c.	.079			
SS		.005	[-.044, .054]	.841
Gender		-.751	[-1.564, -.061]	.069
Model 3.	.373			
SS		.012	[-.030, .053]	.580
Dyspnoea		.650	[.357, .942]	<.000
Age		-.009	[-.045, .021]	.565
Gender		-.330	[-1.148, .420]	.380

Note. Model 1 = Univariate regression analyses with SS as predictor and PA as outcome variable
Model 2a,b,c = Multiple regression analyses with SS as predictor and PA as outcome variable, corrected for confounder dyspnoea OR age OR gender separately.
Model 3 = Multiple regression analyses with SS as predictor and PA as outcome variable, corrected for confounders dyspnoea AND age AND gender together.
PA = physical activity; SS = social support