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# Posttraumatic Stress Disorder Among Older Patients with Chronic Obstructive Pulmonary Disease

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**The prevalence of posttraumatic stress disorder in patients undergoing pulmonary rehabilitation and changes in PTSD symptoms following rehabilitation**

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## PTSD prevalence in pulmonary rehabilitation.

Chronic obstructive pulmonary disease (COPD) is a common, progressive and debilitating condition which causes dyspnoea, cough, and disability.<sup>1</sup> Progressive breathlessness is frequently associated with anxiety, panic fear disorder and depression.<sup>2-4</sup> People with COPD may also experience acute exacerbations which can cause life threatening breathlessness.<sup>1</sup> Functional decline in COPD is associated with reduced physical activity and physical deconditioning.<sup>5</sup> People with COPD frequently become socially isolated and may be blamed for their own disease because they smoked.<sup>6</sup>

Posttraumatic stress disorder (PTSD) is a common serious condition which, although treatable, is often undetected. In PTSD, persistent symptoms of hyperarousal, avoidance and re-experiencing of the event are triggered by reminders of a traumatic experience.<sup>7</sup> Acute medical conditions, such as myocardial infarction, may trigger PTSD,<sup>8</sup> but less is known of the potential for chronic medical conditions to cause PTSD.<sup>9</sup> Alonzo hypothesised that COPD may be a precipitant of PTSD, but commented there were no published data to confirm or refute the hypothesis.<sup>9</sup>

If people with COPD develop PTSD triggered by COPD symptoms, hyperarousal has the potential to aggravate breathlessness. The sensations of breathlessness and anxiety are closely related and anxiety caused by dyspnoea is a normal response to not being able to breathe.<sup>10</sup> In some people with COPD a vicious circle can develop in which breathlessness can cause a disproportionately high level of anxiety and panic, which in turn heighten the perception of severe breathlessness.<sup>4,10</sup>

Avoidance behaviour associated with PTSD has the potential to impair physical and social function. People with COPD avoid physical activity compared to non-affected individuals and thereby reduce the symptoms of breathlessness.<sup>11</sup> Physical inactivity leads to progressive functional and social limitations.<sup>5</sup> Avoidance in PTSD, as defined by the DSM-4, includes a 'feeling of detachment or estrangement from others; restricted range of affect and a

## PTSD prevalence in pulmonary rehabilitation.

sense of foreshortened future', thus PTSD triggered by COPD symptoms may aggravate impaired quality of life and social function. Furthermore PTSD has been shown to be associated with higher levels of cigarette smoking amongst affected individuals,<sup>12</sup> and smoking is a major cause of deterioration in people with COPD.<sup>13</sup>

Pulmonary rehabilitation is an effective therapy for the treatment of COPD.<sup>5</sup> Pulmonary rehabilitation involves exercise training, education and psychosocial support delivered by a multidisciplinary team for groups of patients with chronic lung disease. The exercise programme provides graduated exposure to breathlessness, and as such is similar to exposure techniques used in Cognitive Behaviour Therapy (CBT), including trauma focused behaviour therapy for PTSD.<sup>14</sup> In common with treatments for PTSD, pulmonary rehabilitation involves allowing patients to share their experiences and reactions to traumatic situations, and includes counselling in groups, expressing hidden fears, guilt, anger and denial. In rehabilitation, relaxation and breathing exercises to reduce anxiety associated with dyspnoea are taught.<sup>14</sup> While pulmonary rehabilitation may be expected to help patients with COPD who have a high level of anxiety and impaired social function it is not known if pulmonary rehabilitation will improve PTSD symptoms.

The purpose of this study was to examine (1) the prevalence of current PTSD in patients with COPD referred to pulmonary rehabilitation, (2) any changes in PTSD symptom scores following pulmonary rehabilitation and (3) the relationship between PTSD symptom scores and changes in exercise tolerance and health status measures in patients with COPD.

## **METHODS**

The study was approved by the South West local research ethics committee. Participants were recruited from patients who had been invited to take part in pulmonary rehabilitation at various programmes in Devon, in south west England. All patients referred to pulmonary

## PTSD prevalence in pulmonary rehabilitation.

rehabilitation were initially assessed for their suitability to take part in pulmonary rehabilitation and if selected, were subsequently assessed for inclusion in the study. Figure 1 shows the different stages of assessment and progression through pulmonary rehabilitation and the study.

Members of the pulmonary rehabilitation team checked that patients were willing and suitable to take part in the rehabilitation programme. The rehabilitation assessments were twofold; clinical assessment to ensure suitability and COPD status assessed by exercise tests and questionnaires including the incremental shuttle walking test (ISWT),<sup>15</sup> which is an externally paced test of maximal exercise capacity; the Hospital Anxiety and Depression score (HADS),<sup>16</sup> a self complete 14 item scale with 2 domains (anxiety and depression); and the self-reported version of the Chronic Respiratory Questionnaire (CRQ-SR)<sup>17</sup> which is a disease specific health status measure with 4 domains (dyspnoea, fatigue, emotional function, mastery).

Only patients with a physician diagnosis of COPD confirmed by spirometry who had been accepted for the pulmonary rehabilitation programme were invited to take part in the study. Exclusion criteria were current treatment for major physical co-morbidities, major psychiatric illness, confusion, learning disability, or other conditions impairing ability to give informed consent.

Participants were recruited from 3 pulmonary rehabilitation programmes; 2 were conducted in the community and 1 in a hospital setting. The programmes were similar in terms of their components of exercise, education and psychosocial support, but 2 programmes involved twice weekly sessions and the community based programme was performed once weekly.

### **Study assessments**

### PTSD prevalence in pulmonary rehabilitation.

Those agreeing to take part in the study were interviewed in their own homes at least 1 week prior to start of the pulmonary rehabilitation programme. The assessment was conducted prior to the programme to avoid asking questions which might cause distress to patients at the point when they started the programme. Participants were invited to complete the Posttraumatic Stress Diagnostic Scale (PDS),<sup>18</sup> the Impact of Events Scale Revised (IES-R),<sup>19</sup> and the Medical Outcomes Short Form 12 (SF-12).<sup>20</sup>

The PDS may be used to assess posttraumatic stress disorder, according to DSM-IV criteria. The first part of the PDS consists of 13 questions which focus on a range of previous traumatic events throughout life that participants may have experienced. The second part (8 questions) assesses PTSD symptoms. If participants had more than 1 traumatic event, they are asked to identify the one which “bothered them the most” and complete the questionnaire accordingly. In the final 20 questions participants are asked to rate the severity of symptoms according to the rating scale: 0=not at all, 1=once a week or less/once in a while, 2=2 to 4 times a week/half the time, 3=5 or more times a week/almost always. This scale has shown good reliability and validity and good agreement with the Structured Clinical Interview for Diagnosis of PTSD.<sup>21</sup> The PDS may be used to assess the 6 diagnostic criteria specified in the DSM-4; the nature of the trauma, the 3 symptom clusters (re-experiencing, avoidance and hyperarousal), duration of symptoms, and impaired functioning. For example some respondents may be classified as meeting criteria for re-experiencing symptoms, but not other PTSD symptoms. Only if all 6 criteria are met, is the diagnosis of PTSD confirmed. The PDS may also be scored to produce a quantitative measure of symptom severity for the 3 symptom clusters and the total PTSD score. These are known as symptom severity scores.

The IES-R is a self-reported questionnaire that can be anchored to any specified life event. The scale has 22 items with responses reported using a 0 to 4 Likert scale. The questionnaire focuses on a single episode of trauma and the respondent is asked to rate how

## PTSD prevalence in pulmonary rehabilitation.

distressing they have found the event in the last 7 days. The original IES assessed only intrusion and avoidance; the revised version added a domain of hyperarousal without changing the existing domains.<sup>22</sup> The IES-R may be used to produce a score of the impact of an event in terms of intrusive thoughts, avoidance and arousal, as well as a total score. Both the IES and IES-R have been widely used and have excellent psychometric properties.<sup>14,23</sup>

Participants were also invited to complete the Medical Outcomes Short Form 12 (SF-12).<sup>20</sup> The SF-12 is a 12 item, self-administered questionnaire which is used to assess physical and mental symptoms, social functioning and quality of life. Each question has between 3 and 6 response options using a Likert-type scale. Scores may be derived for 2 subscales, the Physical Component Summary (PCS) and Mental Component Summary (MCS).

The PTSD questionnaires, SF-12, and all of the pulmonary rehabilitation assessments were completed a second time at the final session of the pulmonary rehabilitation programme, 7 to 9 weeks after starting the programme. Those who did not complete the programme and the post pulmonary rehabilitation assessments were considered to have dropped out. Their data recorded prior to pulmonary rehabilitation was used for assessing the prevalence of PTSD and for cross-sectional analysis.

### **Statistical analysis**

Data was collated and analysed using SPSS<sup>®</sup>, (version 14). Descriptive statistics were undertaken to define the participant characteristics and outcome measures. For normally distributed data comparing means was undertaken using the *t*-test (independent samples or paired samples as appropriate). Where data was not normally distributed or failed to meet other assumptions of the *t*-test, non parametric tests were employed. Correlations were undertaken using Pearson's correlation coefficient as the data was approximately normally distributed. Linear regression analysis was performed to examine whether PTSD symptoms

## PTSD prevalence in pulmonary rehabilitation.

affected outcomes following pulmonary rehabilitation, for example the scores for the CRQ-SR, the HADS and the ISWT. For each outcome variable, the final outcome score was entered as the dependent variable, and the initial outcome score and the initial PTSD symptom score were entered as independent variables.

Some missing data was encountered especially in relation to pulmonary rehabilitation records including the baseline characteristics, spirometry, and pulmonary rehabilitation outcome measures. Despite endeavours to locate missing data from the rehabilitation teams or from alternative sources such as hospital or primary care records, some data could not be obtained

## RESULTS

Of 146 attending the pulmonary rehabilitation programme, 122 (83.6%) met the inclusion criteria and were invited to take part in the study. One hundred (82%) were willing and available to participate in the study, their mean age was 68 years (SD 8.2); and 65 (65%) were male.

Spirometry data were available on 85 of the study participants: airflow obstruction was classified according to GOLD guidelines as GOLD II in 27/85 (32%); GOLD III in 41/85 (48%) and GOLD IV in 17/85 (20%).<sup>1</sup> Sixteen were current smokers, 77 were ex-smokers, and only 7 had never smoked. For all participants, the mean total cigarette consumption, expressed in pack years was 45 (SD 28, range 0-140). One pack year is 20 cigarettes per day for 1 year.

### Posttraumatic Stress Disorder

Using the checklist of traumatic events in the PDS, traumatic events were reported by 73 of 100 participants. Many participants reported more than 1 event, and between them, the 73



### PTSD prevalence in pulmonary rehabilitation.

participants reported a total of 192 traumatic experiences. Twenty-seven participants reported no traumatic experiences. Thirty-seven participants reported traumatic experiences related to their lung disease. When asked to select which traumatic experience “bothered them the most”, 24 participants reported that their most traumatic experience was related to their lung disease (Table 1). Traumatic events related to their COPD were mostly caused by acute exacerbations. COPD specific causes were severe breathlessness often accompanied by panic (11/24, 46%), hospitalisation (7/24, 29%), pneumonia accounted for (2/24, 8%), pneumothorax (2/24, 8%), and living with COPD (2/24, 8%).

#### ***Prevalence of PTSD***

Eight of 100 participants met the PDS criteria for PTSD. Six of the 8 participants with PTSD reported a traumatic event related to their lung disease. The number of participants meeting the criteria for re-experiencing was 38/100, for avoidance was 15/100, and hyperarousal 13/100. None of the participants was aware of a prior diagnosis of PTSD.

#### ***PTSD and health status***

PTSD was associated with significantly higher levels of anxiety and CRQ-SR total and emotion domain scores (but not fatigue, dyspnoea or mastery) than those without PTSD (Table 2). Furthermore the MCS of the SF-12 (but not PCS) was lower in participants having PTSD compared to those not having PTSD, (lower scores on the SF-12 indicate worse health status). The ISWT distance achieved did not differ significantly between those with or without PTSD. Although the numbers were small with only 8 participants with PTSD the assumptions of the *t*-test were met; the analysis was repeated using the Mann-Whitney test and the same results were found. There was no correlation between total PDS symptom

### PTSD prevalence in pulmonary rehabilitation.

severity and exercise tolerance (ISWT distance  $r=-0.39$ ,  $n=84$ ,  $P=.72$ ) or between total PDS symptom severity and dyspnoea (CRQ-SR dyspnoea domain  $r=-0.16$ ,  $n=88$ ,  $P=.13$ ).

#### ***Smoking and PTSD status***

No significant associations between smoking status (cigarette consumption or pack years) and measures of PTSD severity (PDS symptom severity score or IES-R total score) were found. Current, ex-smoker, and never smokers were similar with respect to PTSD total symptom score (Kruskal-Wallis) and in the proportion of these participants identified as having PTSD in this study (Chi-square).

#### ***Changes in PTSD measures after pulmonary rehabilitation***

Participants completing the rehabilitation programme ( $n=70$ ) were similar to those who did not complete the programme ( $n=30$ ) with respect to age, gender, airflow obstruction (% of predicted forced expiratory volume in 1 second), smoking status and pack years, ISWT, SF-12 PCS, PDS, and IES-R scores. After pulmonary rehabilitation, exercise capacity and all scores derived from CRQ-SR, SF-12 MCS, and HAD scales improved significantly in this cohort of participants (Table 3). However PTSD symptom severity measured by PDS or IES-R did not change significantly: mean PDS symptoms severity score 5.0(8.9) before, 6.1(7.7) after,  $P=.52$ , mean IES-R total before 4.6 (10.8), after 5.1(12.2),  $P=.24$ . Furthermore, there were no significant changes in the domains scores of the PDS and IES-R after the programme.

#### ***PTSD symptom scores, exercise tolerance, and health status***

Linear regression analyses failed to show any significant differences in outcomes between the PTSD and non-PTSD participants for the rehabilitation outcome variables, namely the

## PTSD prevalence in pulmonary rehabilitation.

domain and total scores for the CRQ-SR, the 2 subscales of the HADS, and the Shuttle walking test (Table 4). Neither the initial PTSD symptom score nor its interaction with the initial CRQ-SR total score are predictors of outcome as represented by the CRQ-SR total score. The analyses indicate that PTSD status does not predict the success of pulmonary rehabilitation.

## DISCUSSION

In this study, we investigate the prevalence of PTSD in patients attending pulmonary rehabilitation, the changes in PTSD symptom status following pulmonary rehabilitation, and whether PTSD symptoms predicted changes on exercise tolerance and health status measures. We found that PTSD was present in a minority (8%) of COPD patients referred for pulmonary rehabilitation. The prevalence of PTSD in normal populations has been estimated at between 1-8%, the highest figure deriving from a nationally representative sample of younger adults ( $\leq 54$  years old) in the USA.<sup>24</sup> In a study of older people aged 55-90 years the prevalence was 1%.<sup>25</sup>

Higher prevalence rates of PTSD have been reported in people suffering from serious medical conditions.<sup>8</sup> Using similar diagnostic measures, we have previously reported that 32% of patients with a previous myocardial infarction met the diagnostic criteria for PTSD.<sup>26</sup> The prevalence after being given the diagnosis of HIV was 30% in one study.<sup>27</sup> The prevalence of PTSD in people with COPD was in line with the findings of a study of psychological diagnoses in patients hospitalised with COPD in which only 1 patient in 50 had PTSD.<sup>28</sup>

Of 8 participants with PTSD, 6 experienced traumatic events related to their lung disease. Thus while the prevalence rate of PTSD in this sample is not high, compared to other traumatic events respiratory related traumas were represented as the most frequent factor

## PTSD prevalence in pulmonary rehabilitation.

causing PTSD. A further study including a control group that did not have COPD would be needed to elucidate this issue further.

This study confirmed that those with PTSD not only reported a worse quality of life as measured by HADS anxiety and the MCS of the SF-12, but also reported worse disease specific quality of life as measured by the CRQ-SR total and emotion domains. No significant differences were found between those with PTSD compared with those who did not have PTSD in respect of HADS depression scores and the PCS of the SF-12 and the dyspnoea, fatigue, and mastery scores of the CRQ-SR. These findings are consistent with the assertion that PTSD is primarily an anxiety disorder.<sup>7</sup>

PTSD has been associated with adverse behaviours likely to affect outcomes in COPD such as smoking.<sup>29</sup> Smoking is the major cause of the development and progression of COPD<sup>13</sup> and smoking cessation is a critical component of COPD management.<sup>1</sup> In this study no evidence was found that PTSD affected smoking status, including current smoking status, daily cigarette consumption, or lifelong consumption of cigarettes.

In the introduction the suggestion was made that hyperarousal in PTSD may be associated with worsening of breathlessness. There was no evidence in this study to support that hypothesis. A further hypothesis was that avoidance associated with PTSD would lead to reduced exercise tolerance. There was no evidence that PTSD generally or avoidance specifically, was associated with higher levels of perceived breathlessness as measured by the CRQ-SR dyspnoea domain or the maximum exercise tolerance as measured by the ISWT. Thus PTSD has not been shown to affect the exercise tolerance of patients with COPD in this study. The study is relatively small with only 8 participants with a diagnosis of PTSD and these findings should be considered as preliminary rather than definitive.

We have hypothesised that pulmonary rehabilitation may have a beneficial effect on participant PTSD symptoms. We found that those with PTSD improved more in respect to

### PTSD prevalence in pulmonary rehabilitation.

anxiety and disease specific health status than those without PTSD. Pulmonary rehabilitation had a substantial beneficial effect on COPD measures including the quality of life and exercise capacity with mean improvement above the minimum clinically important differences (for CRQ-SR domains 0.5 points and for the ISWT 48 meters). However, while disease specific outcome measures and the anxiety domain of the HAD scale showed substantial improvements, PTSD symptoms did not change, indicating that PTSD symptoms were resistant to the general measures provided by pulmonary rehabilitation. One conclusion from this is that specific treatments which address the PTSD *per se*, such as trauma focused CBT, may be needed to improve the PTSD status of people with both PTSD and COPD.

PTSD is present in a small but important proportion of individuals with COPD referred for pulmonary rehabilitation. Participating in such programmes may result in improvements in anxiety and respiratory symptoms, especially amongst those individuals with PTSD. Providers of such programmes should be alert to the psychological status and needs of those attending. For those with PTSD, specific treatments may be needed over and above the therapeutic modalities provided by pulmonary rehabilitation.

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PTSD prevalence in pulmonary rehabilitation.

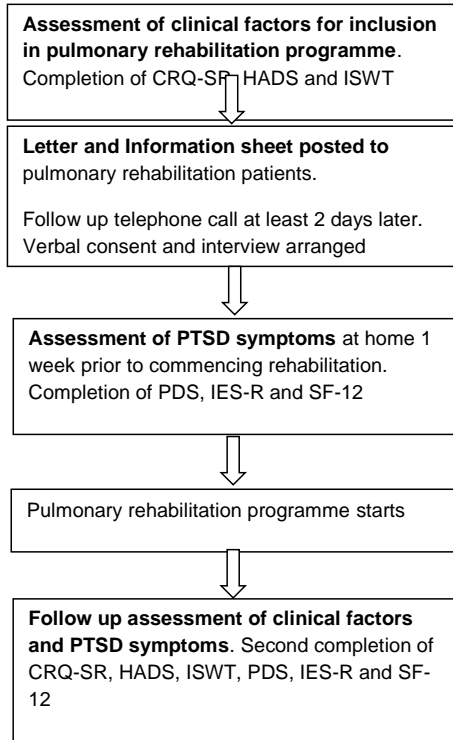
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PTSD prevalence in pulmonary rehabilitation.

**Figure 1.** Flow chart showing different stages of assessment

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Legend: CRQ-SR = Chronic Respiratory Questionnaire – Self-Report; HADS= Hospital Anxiety and Depression Scale; ISWT= Incremental Shuttle Walking Test; PDS= Posttraumatic Stress Diagnostic Scale; IES-R= Impact of Events Scale-Revised; SF-12= Medical Outcomes Short Form 12

**TABLE 1. FREQUENCY AND NATURE OF THE MOST TRAUMATIC EVENTS THAT PARTICIPANTS REPORTED**

Most traumatic event (n=73)	n, %
Respiratory	24, 33
Other illness	11, 15
Bereavement	14, 19

PTSD prevalence in pulmonary rehabilitation.

Illness in loved one	10, 14
Accident/war	10,14
Relationship/social problems	4, 5

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PTSD prevalence in pulmonary rehabilitation.

**TABLE 2. THE DIFFERENCES IN HEALTH STATUS (MEAN( $\pm$ SD)) AND EXERCISE LIMITATION BETWEEN PARTICIPANTS WITH OR WITHOUT PTSD**

	PTSD (n=8)	No PTSD (n=92)	P value*
CRQ-SR total	3.78( $\pm$ .97)	2.99( $\pm$ .60)	0.026
CRQ-SR emotion	4.27( $\pm$ 1.32)	3.25( $\pm$ .86)	0.038
CRQ-SR fatigue	3.82( $\pm$ 1.39)	2.88( $\pm$ .60)	0.061
CRQ-SR dyspnoea	2.53( $\pm$ 1.06)	2.08( $\pm$ .48)	0.235
CRQ-SR mastery	4.45( $\pm$ 1.34)	3.77( $\pm$ 1.23)	0.171
SF-12 (PCS)	29.90( $\pm$ 6.61)	32.64( $\pm$ 8.16)	0.514
SF-12 (MCS)	25.98( $\pm$ 6.84)	32.65( $\pm$ 7.65)	0.009
HADS anxiety	11.88( $\pm$ 4.09)	7.33( $\pm$ 4.16)	0.010
HADS depression	8.13( $\pm$ 2.80)	6.37( $\pm$ 3.29)	0.106
ISWT (meters)	163.75( $\pm$ 87.66)	189.88( $\pm$ 114.55)	0.533

Legend: CRQ-SR = Chronic Respiratory Questionnaire – Self-Report; SF-12= Medical Outcomes Short Form 12; PCS= Physical Component Score; MCS= Mental Component Score; HADS= Hospital Anxiety and Depression Scale; ISWT = Incremental Shuttle Walking Test

For all tests, higher scores indicate worse health status, except SF-12 and shuttle walking test, where lower scores indicate worse health status \**t*-test

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PTSD prevalence in pulmonary rehabilitation.

**TABLE 3. CHANGES IN OUTCOMES FOLLOWING PULMONARY REHABILITATION IN ALL PARTICIPANTS (MEAN±SD)**

Measure	Before Pulmonary Rehabilitation	After Pulmonary Rehabilitation	<i>P</i> value*
<b>CRQ-SR total score</b>	3.71±0.97	4.50±0.94	.001
<b>CRQ-SR dyspnoea</b>	2.49±1.03	3.12±1.14	.001
<b>CRQ-SR fatigue</b>	3.73±1.37	4.54±1.62	.001
<b>CRQ-SR emotion</b>	4.18±1.32	5.02±1.35	.001
<b>CRQ-SR mastery</b>	4.39±1.33	5.29±1.19	.001
<b>ISWT (meters)</b>	191±105	246±130	.001
<b>SF-12 PCS</b>	33.3±8.3	33.0±7.4	.735
<b>SF-12 MCS</b>	32.2±7.8	35.5±7.5	.001
<b>HADs Anxiety</b>	7.7±4.0	5.4±3.9	.001
<b>HADs Depression</b>	6.4±3.2	5.4±3.8	.025
<b>PDS symptoms severity</b>	5.0±7.6	6.2±7.7	.239
<b>IES-R total</b>	4.5±10.8	5.1±12.2	.520

Legend: CRQ-SR = Chronic Respiratory Questionnaire – Self-Report; ISWT = Incremental Shuttle Walking Test; SF-12= Medical Outcomes Short Form 12; PCS= Physical Component Score; MCS= Mental Component Score; HADS= Hospital Anxiety and Depression Scale; PDS= Posttraumatic Stress Diagnostic Scale; IES-R= Impact of Events Scale-Revised

For all tests, higher scores indicate worse health except SF-12 and shuttle walking test, where lower scores indicate worse health status \**t* test

PTSD prevalence in pulmonary rehabilitation.

**TABLE 4. SUMMARY OF EIGHT LINEAR REGRESSION ANALYSES TO ASSESS THE CONTRIBUTION OF THE INITIAL PTSD SYMPTOM SEVERITY SCORE TO FINAL OUTCOME AFTER CONTROLLING FOR INITIAL OUTCOME SCORE**

<b>Outcome variable, n</b>	<b>Standardised coefficients (beta) for initial PTSD symptom score</b>	<b><i>t</i></b>	<b><i>P</i> value</b>
<b>CRQ-SR</b>			
Total, 68	.046	.45	.66
Dyspnoea, 68	.046	.45	.66
Fatigue, 70	.008	.08	.94
Emotion, 70	.163	1.62	.11
Mastery, 70	.141	1.31	.20
<b>HADS</b>			
Anxiety, 70	.049	.47	.64
Depression, 70	.098	.94	.37
<b>ISWT, 69</b>	<b>-.035</b>	<b>-.52</b>	<b>.61</b>

Legend: CRQ-SR = Chronic Respiratory Questionnaire – Self-Report; HADS= Hospital Anxiety and Depression Scale; ISWT = Incremental Shuttle Walking Test; t= test statistic