Fatigue in COPD

Dr. Jan Vercoulen, Clinical Psychologist

Dpt. Medical Psychology
Radboud University Nijmegen Medical Center
Definition COPD  GOLD, 2016

• Chronic Obstructive Pulmonary Disease = common preventable and treatable disease that is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lungs to noxious particles or gasses.

• Exacerbations and comorbidities contribute to the overall severity in individual patients

• Symptoms:
  • Dyspnea
  • Chronic cough
  • Chronic sputum production

  Fatigue is not listed
Is fatigue an issue in COPD?

• Research: hardly any studies fatigue in COPD

• Patients:
  • 50% report fatigue every day or at least some days per week
  • Describe as: ’general feeling of fatigue’, ‘drained of energy’, invalidating’, making dependent of others
  • Associated with: irritation, frustration, concentration problems’
Prevalence fatigue and relationship health status (Peters et al., 2011)

- 168 outpatients with stable moderate – severe COPD

- Assessment fatigue: Checklist Individual strength (Vercoulen et al., 1994)
  - Standardized questionnaire validated in many patient populations & healthy subjects.
  - Many translations
  - Subscale *Subjective Fatigue*: 8-items, 7-point Likert scale
  - Discriminates between ‘normal fatigue’, ‘mild fatigue’, ‘severe fatigue’
  - Minimal clinically important difference (MCID) > 10 points
Prevalence fatigue in COPD

Peters et al., 2011

<table>
<thead>
<tr>
<th>CIS-Subjective fatigue</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal fatigue</td>
<td>88 (52%)</td>
</tr>
<tr>
<td>Mild fatigue</td>
<td>39 (23%)</td>
</tr>
<tr>
<td>Severe fatigue</td>
<td>41 (25%)</td>
</tr>
</tbody>
</table>
Health Status assessment (including Fatigue)

- Physiological tests, battery of questionnaires
- Organized by a validated multi-dimensional assessment framework (Vercoulen et al., 2008, Peters et al., 2009)

Nijmegen Clinical Screening Instrument (NCSI)
# Relationships Fatigue and other aspects of Health Status

<table>
<thead>
<tr>
<th>Main domains</th>
<th>Fatigue</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS Sub-domains</td>
<td></td>
</tr>
<tr>
<td>Physiological functioning</td>
<td></td>
</tr>
<tr>
<td>Airflow</td>
<td>-</td>
</tr>
<tr>
<td>Static Lung volumes</td>
<td>-</td>
</tr>
<tr>
<td>Exercise capacity</td>
<td>0.30</td>
</tr>
<tr>
<td>Muscle strength</td>
<td>-</td>
</tr>
<tr>
<td>Body composition</td>
<td>-</td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
</tr>
<tr>
<td>Dyspnea</td>
<td>0.60</td>
</tr>
<tr>
<td>Dyspnea emotions</td>
<td>0.34</td>
</tr>
<tr>
<td>Functional Impairment</td>
<td></td>
</tr>
<tr>
<td>Subjective</td>
<td>0.59</td>
</tr>
<tr>
<td>Behavioural</td>
<td>0.46</td>
</tr>
<tr>
<td>Accelerometer (electronic)</td>
<td>-</td>
</tr>
<tr>
<td>Quality of Life</td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>0.51</td>
</tr>
<tr>
<td>Health-Related</td>
<td>0.55</td>
</tr>
<tr>
<td>Relationships</td>
<td>0.37</td>
</tr>
</tbody>
</table>

Correlations printed $P<0.01$

Peters et al., 2011
Effects standard treatment on fatigue

Standard treatment: medication, smoking-cessation, dietary advice. Advice remain active.

4-year longitudinal study on fatigue in COPD (Peters et al., 2011)
77 outpatients with moderate – severe COPD

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Severe Fatigue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>25%</td>
</tr>
<tr>
<td>After 4 years</td>
<td>42%</td>
</tr>
</tbody>
</table>

→ We need to do more than standard treatment!
Causes of fatigue

Physiological
- Few studies on fatigability of breathing muscles → related to increasing exercise limitation
- Hardly any studies on subjective experience of fatigue
  - Most use fatigue as outcome in treatment studies
  - Not related to airflow limitation (Peters et al., 2011)

Psychological
- Anxiety & Depression
- Dyspnoea
- Treatment not specifically directed at fatigue
Causes of fatigue. What can we learn from clinical practice?

- Symptoms
- Functional impairments
- Problems quality of life (QoL)

... are poorly related to physiological processes, such as airflow limitation

→ The ‘missing link’ = *psychological processes*
A simple model

Vercoulen et al., 2008

Physiological sensations

Obstruction/
Breathing dysreg.

Deconditioning/
exhaustion

Physiological Functioning
- Pulmonary
- Non-pulmonary

Psychological

Cognitions
- Perceptual bias
- Consequences
- Control
- Causal
- Future

Emotions
- Anxiety
- Frustration

Behaviour
- Avoidance/overexertion
- Compliance

Symptoms
- Dyspnea
- Fatigue

QoL Impairments

Radboudumc
Symptoms: interaction physiology and psychology

Physiological

Psychological
Cognitions, Emotions, Behaviour, Social

Symptoms, Impairments QoL

This holds true for every patient! → normal human psychological processes, not psychiatric disorders.
Adaptation to the disease (self-management)

Chronic illness: normal life changes drastically and permanently

Patient faces the challenge to adapt to this new situation

- Symptoms (fatigue), Functional Impairment & QoL are resultant of the cognitive, emotional and behavioural ADAPTATION to the PHYSIOLOGICAL DISORDERS

- Behaviour change is required
Main intervention strategies

• Fatigue is the result of a complex interaction between many physiological and psychological processes

• Treatment strategies:
  1. Optimizing physiological disorder
  2. Optimizing adaptation to the physiological disorder (by teaching self-management)
Pulmonary rehabilitation

Pulmonary rehabilitation program Radboudumc, location Dekkerswald

- 10-week program

- Inpatient setting (Monday to Friday)

- Inter-disciplinary (pulmonologist, psychologist, physiotherapist, nurse, psychomotor therapist, dietician, social worker, art therapist)

- Treatment is tailored to the individual patient, based on a thorough assessment of health status and adaptation to the disease (3 days)
  - Physiological tests, questionnaires, accelerometer
  - Interviews with seven disciplines
Treatment of fatigue: physical

Goals:
• Increasing exercise capacity,
• slowing down decline airflow limitation
• decreasing number of exacerbations

Means:
• Physical training: increasing cardiovascular fitness, muscle strength
• Medication
• Avoidance of noxious particles and gasses
• Exacerbation management
• Life style:
  • smoking cessation
  • healthy nutrition
  • regular exercise

All these ‘physical’ goals require **behaviour change** by the patient!
Treatment of fatigue: psychological

Goals:
• Improving self-management

• Means: principles of cognitive behavioural therapy (in part Chronic Fatigue Syndrome treatment protocol)
  • Behaviour change to enable physical goals previous slide
  • Anxiety & depression
  • Reducing stress
  • Grieving process
  • Energy saving techniques
  • etc
Treatment of fatigue behavioural/psychological example

• Over-exercisers: Adequate **energy saving strategies**:
  • Day structure: sleep/wake, meals
  • Slowing down pace
  • Spreading activities over the day/week
  • Identifying bodily signals
  • Performance activities guided by these signals (e.g. brief rest, pacing)
  • Learning to ask for help

• Avoiders: **reactivation**
  • Reducing fear for dyspnea (or even fatigue)
  • breathing regulation techniques
Inter-disciplinary approach

Avoiders: some examples

- Psychologist:
  - analyses causes of avoidance (cognitive, emotional, behavioural, social)
  - stimulate experimenting in settings of other disciplines

- Physiotherapist / psychomotor therapist
  - actual practice with new behaviours (breathing techniques, energy saving strategies)
  - experience benefits of new behaviours and change dysfunctional cognitions

- Nurse:
  - Practicing daily activities (taking a shower, chores, etc.)
Effect pulmonary rehabilitation on fatigue

Patient characteristics

• 459 patients with COPD

• 54% male

• 60.5 ± 8.8 years

• GOLD-classification (severity airflow limitation $\rightarrow$ FEV$_1$%pred.)
  • Stage 1: 4% (mild)
  • Stage 2: 22% (moderate)
  • Stage 3: 47% (severe)
  • Stage 4: 27% (very severe)
Prevalence of Fatigue pre and post rehabilitation

Before rehabilitation:
- 7% normal fatigue
- 93% abnormal fatigue

After rehabilitation:
- 33% normal fatigue
- 67% abnormal fatigue, but reduced severity
49% of the patients showed a MCID improvement (≥ 10 points)

Effect-size (Cohen’s d)= 1.03 ‘large effect’
# Correlations between change fatigue and change health status

<table>
<thead>
<tr>
<th>Main domain</th>
<th>Sub domain</th>
<th>( \Delta_{\text{fatigue by}} ) ( \Delta_{\text{sub-domain}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiological Functioning</td>
<td>Airflow</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td>Body Composition</td>
<td>-0.14</td>
</tr>
<tr>
<td></td>
<td>Static Lung Volumes</td>
<td>0.01</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Dyspnea</td>
<td>0.37**</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Subjective Impairment</td>
<td>0.30**</td>
</tr>
<tr>
<td>Quality of Life</td>
<td>General QoL</td>
<td>0.30**</td>
</tr>
<tr>
<td></td>
<td>HRQoL</td>
<td>0.43**</td>
</tr>
<tr>
<td></td>
<td>Satisfaction Relations</td>
<td>0.14*</td>
</tr>
</tbody>
</table>
Conclusion

- Fatigue is a major, but neglected problem in COPD.

- Fatigue is result of complex interactions physiological and psychological processes.

- Inter-disciplinary rehabilitation has a strong beneficial effect on fatigue in COPD patients (even severe and very severe).

  - CIRO/Maastricht University Medical Center
  - Radboud University Medical Center
  - Amsterdam Medical Center