Improving cognition and healthy lifestyle behavior in chronic obstructive pulmonary disease

Impact

Chronic obstructive pulmonary disease (COPD) is one of the highest-burden chronic diseases worldwide. Lung function impairment is characterized by airflow limitation that is usually progressive and largely irreversible (1). COPD is a substantial cause of disability and mortality: 299 million people worldwide were estimated to suffer from the disease in 2017 and COPD was responsible for 3 million deaths in 2016, making it the third most common cause of death worldwide (2).

Although COPD is primarily a lung disease, various manifestations outside the respiratory system are common, including metabolic abnormalities (3, 4), muscle dysfunction (5) and cognitive impairment (CI) (6). CI worsens patients' quality of life (7, 8) and health outcomes (9, 10), it decreases their ability to engage in activities of daily living (11) and it increases their risk of hospitalization (12). All of this contributes to a vicious cycle in which patients' health status deteriorates even further, and to a considerable economic burden for society (13, 14). It is therefore very important to optimally manage COPD from a holistic perspective, consider CI as comorbidity and to assist patients in attaining and maintaining a healthy lifestyle. This thesis investigated determinants of cognitive performance in patients with COPD and the potential efficacy of working memory training (WMT) and nutritional management next to motivational regulations in increasing patients' adherence to a healthier lifestyle.

Relevance for patients

The results of this thesis are very relevant to patients with COPD. Awareness regarding the adverse impact of their disease and leads for improvement might translate into their health status and wellbeing. Improved prospective memory could for example improve self-management and treatment adherence. Improved executive functioning could enhance self-control, enabling patients to resist tempting unhealthy lifestyle choices in favor of more controlled and healthier ones. The WMT that we developed and evaluated as single intervention was unable to improve overall cognitive functioning or adherence to a healthy lifestyle. Nevertheless, interventional modalities, such as daily-life cognitive stimulation (e.g., playing chess (15), completing sudokus (16) or engaging in social interaction (17, 18)) physical activity (19, 20) and dietary improvement (21, 22), have been shown to benefit cognitive performance in non-COPD populations and are recommended, also in light of other common comorbidities in COPD.

Relevance for clinical practice

Raising awareness for cognitive impairment in COPD and interventions (also) targeting cognitive functioning in these patients is very relevant for caregivers. The prevalence of CI was particularly high in patients referred for pulmonary rehabilitation (PR) compared to earlier prevalence estimates in stable patients in population studies (6). This, and the fact that CI has been related to adverse health outcomes including the likelihood of dropping out of PR (23), underlines the importance for PR providers to recognize the possible presence of CI in their patients and to tailor educational programs to patients' cognitive capacities.

Furthermore, new insights in specific motivational regulations associated with indicators of adherence to a healthy lifestyle (i.e., physical activity and dietary quality) are important to consider in refining COPD-specific lifestyle counseling interventions.

Relevance for society

A main aim of this thesis was to determine the health and lifestyle benefits of the investigated interventions. WMT was ineffective, but targeted nutritional management improved patients' health status at an increase of costs that might be considered acceptable for patients with a high disease burden. Moreover, motivational interventions, if proven feasible as discussed above, might cost-effectively improve patients' lifestyle, health status, quality of life and functional capacities as well. This enables patients to live more meaningful lives for a longer period of time, for instance by prolonging their ability to work. Furthermore, it might decrease health care expenditure and the COPD-associated disability burden. Both are relevant for society, as rising health care costs present a large and growing economic burden and COPD is the fifth-leading cause of disability-adjusted life years (DALYs) worldwide (24).

Relevance for commercial parties

Motivational counselling does not have to remain confined to health care professionals. In fact, counselling by commercial parties would take work away from health care professionals, which would alleviate the growing work pressure and financial burden on the health care system.

Incorporating counselling into an e-health application could reduce the workload associated with counselling even further. Various applications have been developed over the past years to improve chronic disease management with promising results on health outcomes, such as myIBDcoach (25, 26) for inflammatory bowel disease and SanaCoach COPD for COPD (27). Counselling could even take place entirely virtually. Habtic, an app developed to improve the lifestyle of corporate employees, already uses such virtual, yet highly realistic, avatars.

The NUTRAIN trial showed that nutritional supplementation can improve the overall health status of patients with COPD in a cost-effective manner. Further developing medical foods and/or supplements, aimed at improving physical capacity and health status but also building forth upon promising results regarding their benefits on cognitive functioning (28, 29), for instance, could therefore be promising for commercial parties.

Developing WMT modalities and marketing them as games has been an important focus of industry in the past 20 years. Although these games are often supported by claims that their effectiveness has been proven, independent investigations routinely indicate they do not improve cognitive or real-life task performance (30-32). The results of the current thesis also indicate that further developing WMT applications is likely not worthwhile.

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