A Health Coaching Self-Management Programme for Patients with Chronic Obstructive Pulmonary Disease

An Explorative and Interventional Study

Lan Wang
Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is a primary cause of chronic morbidity and mortality and contributes to an increased economic and social burden on patients and families. Self-management education as one non-pharmacological treatment approach is highlighted in guidelines. Although self-management programmes have shown positive effects for COPD, lack of disease-specific self-management skills, high dropout rates, and poor attendance of participants are problems which should be taken under consideration. One way to cope with the problems is to use a more motivational approach which focuses on patients’ health decisions in cooperation with healthcare practitioners, combined with systematic and structured health coaching. However, there is a lack of such studies, which are needed to explore the effects of self-management on patients with COPD by health coaching, not least in China.

Aims: The overall aim of this thesis was to explore sociodemographic and clinical factors influencing self-management and to test and evaluate a health coaching self-management programme for patients with COPD in China.

Methods: The study’s design was explorative, prospective, and longitudinal, with both quantitative and qualitative approaches. Specifically, a quantitative method with a cross-sectional approach was used to explore the self-management status of patients with COPD and examine the associations with socio-demographic and clinical variables (I). Furthermore, a prospective randomized controlled trial was conducted to study the longitudinal effects of the health coaching self-management programme using a repeated-measures analysis of variance model of patients with COPD (II & III). A qualitative study implementing inductive content analysis was used to describe and explore participants’ experiences of the health coaching self-management programme of patients with COPD (IV).

Results: High physical activity, high salary, and low age affected the self-management of patients with COPD most positively (I). The health coaching programme improved lung function, physical activity, quality of life, and self-management skills, as well as psychological status in both the short and long term (II & III). Participants expressed their experiences of the health coaching self-management programme as making them more aware of the importance of knowledge of the disease and their own responsibilities, taking action to
maintain a healthy lifestyle, feeling supported by the programme, and being hindered by individual and programme limitations (IV).

Conclusions: This thesis contributes to knowledge about the self-management skills of patients with COPD, which is low in China. A health coaching self-management programme with iterative interactions between patients and healthcare professionals represented a valuable and effective intervention designed to improve health-related outcomes. Moreover, low literacy, poor physical condition, and family and economic burdens should be taken into account in the development of future self-management programmes in China.

Keywords: Chronic Obstructive Pulmonary Disease, Self-management, Health coaching
Original papers

Paper 1

Paper 2

Paper 3
Lan Wang, Annette Nygårdh, Yue Zhao & Jan Mårtensson. Effects of a Health Coaching Self-management Programme in patients with Chronic Obstructive Pulmonary Disease on self-management skills and psychological status: a Randomized Controlled Trial. *(In Manuscript)*

Paper 4
Contents

Abbreviations.................................................................................................................. 1
Preface ............................................................................................................................ 2
Introduction .................................................................................................................... 3
Background.................................................................................................................... 5
  Chronic Obstructive Pulmonary Disease ................................................................. 5
  COPD care .................................................................................................................. 6
  Experiences of living with COPD from a patients’ perspective ......................... 7
  Self-management ..................................................................................................... 8
  Self-efficacy .............................................................................................................. 9
  Self-management interventions in COPD .............................................................. 10
  Health coaching ..................................................................................................... 11
  Person-centred care ............................................................................................... 13
Rationale for the thesis ................................................................................................. 15
Aims ............................................................................................................................... 16
Methods ........................................................................................................................ 17
  Design....................................................................................................................... 17
  Participants and setting ......................................................................................... 17
  Procedures .............................................................................................................. 21
  Data collection .................................................................................................... 24
    Cross-sectional study (I) .................................................................................. 24
    Intervention study (II–IV) ............................................................................... 25
  Data analysis ......................................................................................................... 28
    Quantitative analysis (I–III) ......................................................................... 28
    Inductive qualitative content analysis (IV) ................................................... 29
Ethical considerations.................................................................................................... 30
  Autonomy............................................................................................................... 30
Beneficence and Non-Maleficence ......................................................... 30
Justice ................................................................................................. 31

Results ............................................................................................... 32

Influencing factors associated with self-management among patients with COPD .......................................................................................... 32
Effects of a health coaching self-management programme ................ 33
Experiences of a health coaching self-management programme from the patients’ perspective .................................................................................. 40

Discussion ........................................................................................... 43

Methodological considerations ................................................................ 43

Validity in Quantitative methods (I- III) ............................................. 43
Trustworthiness in Qualitative methods (IV) .......................................... 45
Discussion of the results ....................................................................... 47

Conclusion .......................................................................................... 55

Clinical and research implications ..................................................... 56
Implications for healthcare practice ................................................... 56
Implications for further research ......................................................... 56

Chinese summary ................................................................................ 57

Acknowledgements ............................................................................ 62

References .......................................................................................... 64
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCQ</td>
<td>COPD clinical questionnaire</td>
</tr>
<tr>
<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
</tr>
<tr>
<td>CSMS</td>
<td>COPD Self-Management Scale</td>
</tr>
<tr>
<td>FEV₁</td>
<td>The ratio of forced expiratory volume in 1 second</td>
</tr>
<tr>
<td>FVC</td>
<td>Forced vital capacity</td>
</tr>
<tr>
<td>GOLD</td>
<td>Global Initiative for Chronic Obstructive Lung Disease</td>
</tr>
<tr>
<td>GPAQ</td>
<td>Global Physical Activity Questionnaire</td>
</tr>
<tr>
<td>HADS</td>
<td>Hospital Anxiety and Depression Scale</td>
</tr>
<tr>
<td>PCC</td>
<td>Person-centred care</td>
</tr>
<tr>
<td>RCT</td>
<td>Randomized Controlled trial</td>
</tr>
<tr>
<td>STS</td>
<td>Sit to Stand</td>
</tr>
</tbody>
</table>
Preface

The management of respiratory diseases is my main subject as a lecturer in clinical and teaching practice in a nursing education. Chronic Obstructive Pulmonary Disease (COPD) is gaining increasing attention as a health challenge due to its high prevalence and mortality, and it is currently the fourth most prevalent cause of death in the world. Repeated acute exacerbations impose heavy burdens on both patients with COPD and their families.

The Healthy China 2030 plan points out that prevention and management of chronic diseases is the basis of the strategic development programme. Self-management interventions for COPD were first highlighted in the report of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) in 2017. This guideline is at present applied to guide health professionals in implementing its treatment and management in China. However, there is a shortage of disease-specific self-management interventions for patients with COPD in China because of insufficient health professionals to guide the implementation of self-management projects. These circumstances inspire me to focus on this project.

An academic collaboration between the School of Health and Welfare at Jönköping University and the School of Nursing at Tianjin Medical University was formally initiated in 2009. This collaboration afforded me the opportunity to become a doctoral student 2014 and continue to work closely with health care professionals and patients with COPD, as well as gain a deeper understanding of the self-care concept for patients with chronic disease. If we can promote the self-management of patients with COPD and guide nurses to implement systematic strategies for patients, this could lead to an improved quality of nursing and medical services for this group of patients in China.
Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a global public health challenge (GOLD, 2018) with a global prevalence of 11.7% (Adeloye et al., 2015), due to the fact that COPD increases with age (Halbert et al., 2006; Quach et al., 2015), smoking habits (Mannino et al., 2015), and other exposure to particles, such as occupational exposure (Paulin et al., 2015) and indoor and outdoor air pollution (Eisner et al., 2010; Orozco-Levi et al., 2006).

In the United States, a mean cost is $4000 per patient per year (Guarascio et al., 2013). In Europe, the annual costs of healthcare and lost productivity due to COPD are estimated at €48.4 billion (ERS, 2018). The factors of COPD are related to long-term exposure to noxious gases or particles, as well as individual conditions involving genetics, airway hyper-responsiveness, and poor lung structure (Lange et al., 2015; Stern et al., 2007; Tashkin et al., 1992). The primary cause of COPD is tobacco smoke, and tobacco-related deaths is projected to increase to 8.3 million deaths per year by 2030 (WHO, 2018). In many developing countries, although COPD has been recognized as a fatal health problem, it is ignored by governments (Barnes, 2007).

In China, the prevalence of COPD is 14% among people aged > 40 years old (Wang et al., 2018), and in 2013 there were more than 900,000 patients who died of COPD, which accounts for 31% of the total deaths from COPD in the world (Yin et al., 2016). The per capita direct annual economic burden of COPD hospitalized patients increased from $3,000 to $4,000 during 2005–2013 in Beijing (Huang, 2015). Cigarette smoking and air pollution with heavy exposure to PM$_{2.5}$ (2.5-µm diameter particulate matter) are major preventable risk factors for COPD in China, and the prevalence of smoking is 49.8% and 2.2% in males and females respectively in the adult population (Wang et al., 2018). Furthermore, physical inactivity and bad nutritional supply also contribute to the deterioration accompanying COPD (Aniwidyaningsih et al., 2008; Watz et al., 2014).

Self-management refers to the individual’s ability to undertake healthy behaviors and preventive strategies to promote health (Richard & Shea, 2011). Self-management skills for patients with COPD involve controlling and early detection of symptoms deterioration, taking medication regularly, maintaining a healthy diet, and quitting smoking, as well as managing bad psychological status. In addition, it involves using available various resources, such as
healthcare professionals, relatives, and colleagues (Korpershoek et al., 2017; Stoilkova et al., 2013). Self-management education, as one strategy of non-pharmacologic treatment, has been recommended in the global guideline of COPD (GOLD, 2018). Several systematic reviews of self-management interventions of patients with COPD have shown that self-management programme interventions could reduce the hospital admissions and emergency department visits, decrease dyspnea, and improve health-related quality of life (Jonkman et al., 2016; Newham et al., 2017; Zwerink et al., 2014). However, high dropout rates and patients’ poor attendance have been reported to affect the quality of self-management programmes (Fischer et al., 2007; Keating et al., 2011). Therefore, considering patients’ perceptions and motivating their enthusiasm to participate in such programmes is essential.

Health coaching, as one self-management strategy, has been used in the follow-up of COPD to motivate patients to be active participants in self-management by interacting with healthcare professionals (Kivelä et al., 2014). This strategy also reduces rehospitalization (Benzo et al., 2016) and disease-related healthcare utilization (Coultas et al., 2018), as well as improving disease-specific quality of life (Benzo et al., 2016). Although health coaching programmes have proved to be effective in the short term in chronic disease, their long-term effectiveness seems to be unclear (Hill et al., 2015; Kivelä et al., 2014). Furthermore, there is little evidence of health coaching programmes for self-management in China.

To address this gap, a health coaching self-management programme was conducted for patients with COPD in China. In order to evaluate the programme from both objective and subjective perspectives, the quantitative health outcomes of the RCT programme and a qualitative evaluation of patients’ experiences in participating in the programme were combined.
Background

Chronic Obstructive Pulmonary Disease

COPD is defined as ‘a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.’ (GOLD, 2018). Cough with sputum and dyspnea are the most common symptoms of COPD. Other multiple symptoms, such as wheezing, chest tightness, fatigue, weight loss, anxiety, and depression, are other problems which lead to major symptom burdens (Bentsen et al., 2013; Joshi et al., 2012). These symptoms vary throughout the day, with more serious symptoms in the morning, which affects daily activities (Miravitlles et al., 2017). Higher morbidity and mortality with COPD (GBD, 2017) contribute to a higher economic and social burden (Lozano et al., 2012; Vos et al., 2012).

Cigarette smoking is the most significant risk factor for COPD in the world (GOLD, 2018). Passive smoking may also contribute to COPD through increasing levels of inhaled toxic particles and gases, which result in lung degradation (Ukawa et al., 2017). Exposure to biomass smoke, such as wood and coal when cooking and heating indoors, has also been shown to be a high risk for generating COPD in developing countries (Capistrano et al., 2017).

Cigarette smoking and air pollution with heavy exposure to PM_{2.5} (2.5-µm diameter particulate matter) are major preventable risk factors for COPD in China (Wang et al., 2018). About 50% of the patients with COPD are former or current smokers, and about 11–14% of former or current smokers suffer from COPD (Wang et al., 2018). A recent cross-sectional study showed that exposure to higher particulate matter (PM) concentrations (PM_{10} compared to PM_{2.5}) was strongly associated with increased COPD prevalence and declining respiratory function (Liu et al., 2017). Other risk factors for developing COPD include low socioeconomic status, male, aging, asthma, hyper-reactivity, chronic bronchitis, and infections (GOLD, 2018). However, gender differences are decreasing due to increased tobacco smoke exposure among females, who are more susceptible to the effects of tobacco (Foreman et al., 2011; Tam et al., 2016).
Forced expiratory volume in 1 second (FEV₁) is a very important index in predicting mortality and hospitalization at the population level, and it is used to classify the severity of COPD from mild to very severe according to the cut-off points of FEV₁ (GOLD, 2018). FEV₁ will be reduced with chronic respiratory inflammation (Hogg et al., 2004). However, FEV₁ cannot be used alone to determine all therapeutic options for a given patient because symptoms and exacerbation history should also be assessed.

Due to serious symptoms and many risk factors influencing disease progression, early diagnosis, prevention, and maintenance therapy are crucial for COPD care.

COPD care

Spirometry with a post-bronchodilator FEV₁/FVC < 0.7 is the golden standard diagnosis of COPD in the clinical context, and possible concomitant respiratory, skeletal, and cardiac disease should be checked by chest X-ray. Symptoms of shortness of breath, chronic cough, and sputum and exposures to risk factors for disease such as host factors, tobacco, occupation, and indoor/outdoor pollution should also be considered (GOLD, 2018).

Once COPD has been diagnosed, effective therapy strategies for the reduction of current symptoms and future risk factors of exacerbations should be identified. The guideline recommends that a pharmacotherapeutic approach should depend on the availability and expense of drugs and patients’ clinical response balanced against side effects (GOLD, 2018). The purpose of medication is to relieve symptoms, decrease the frequency of acute exacerbation of COPD, and improve physical activity and health status. The recommended types of medications to treat COPD in GOLD are bronchodilators, antimuscarinic drugs, and methylxanthines. The inhaler technique is essential for all patients because the main medication of COPD is the inhalant. The choice of inhaler device should be individualized to suit patients’ abilities and preferences, access, and costs as well as physicians’ recommendations. It is necessary to demonstrate the inhaler techniques to patients and re-check them in every outpatient visit to ensure that the inhaler is being used correctly (Li et al., 2016).

It is important to emphasize that individualized pharmacological treatment combined with non-pharmacological strategies should be implemented (GOLD, 2018). Non-pharmacological treatments with self-management
education, physical activity, pulmonary rehabilitation programmes, exercise training, nutritional support, vaccination, oxygen therapy, ventilation therapy, and interventional bronchoscopy and surgery are recommended in the guideline (GOLD, 2018). Pulmonary rehabilitation is a highly effective therapeutic strategy (Puhan et al., 2011) which has proved to improve shortness of breath, health status, and exercise tolerance (McCarthy et al., 2015). Traditional Chinese Medicine (TCM) has been identified to reduce risk factors and improve lung function, quality of life, and exercise capacity in Chinese patients with COPD (Wang H et al., 2015), including such methods as Liuweibuqi capsules (Wang C et al., 2015), Buzhong Yiqi Tang (Chen et al., 2016), Bu-Fei Jian-Pi granules, Bu-Fei Yi-Shen granules, and Yi-Qi Zi-Shen granules (Li et al., 2013). Acupuncture has shown to improve quality of life and exercise capacity (Feng et al., 2016) and traditional Chinese exercise (TCE) with Tai Chi, Liu Zijue, Wu Qinxi, and Ba Duanjin has shown to have a positive impact on the stability of lung function, movement endurance, and quality of life in patients with COPD (Luo et al., 2016).

It is crucial for patients with COPD to understand the progress of the disease, the risk factors for acute exacerbation, and the individual’s role, as well as what role their healthcare providers should play in order to achieve improved health outcomes. The guideline proposes that all of the recommendations for treatment of COPD should incorporate patients’ experiences and preferences (GOLD, 2018). Understanding patients’ personal experiences with the disease are crucial for developing strategies to cope with symptoms linked to COPD (Apps et al., 2014; Duangpaeng et al., 2002).

Experiences of living with COPD from a patients’ perspective

The knowledge among patients with COPD about their disease has been reported to be poor in several respects, specifically regarding the causes of COPD, the consequences of therapy, the management of exacerbation (Hernandez et al., 2009), and the fact that COPD is incurable and fatal (Gott et al., 2009). Some patients have feelings of guilt because their own detrimental habits associated with smoking contributed to this serious disease, and they realize that it will be a permanent feature of their lives (Lindqvist & Hallberg, 2010). They experience alternating good and bad days and increasing vulnerability and unpredictable setbacks (Giacomini et al., 2012).
A sense of loss and frustration, depression, anxiety, hopelessness, and limitations on their lifestyle and social interactions are expressed, as well as uncertainty about the future and the fear of becoming a burden on their families with the progression of the disease (Rosa et al., 2018; Russell et al., 2018). Acute exacerbation is expressed as the most terrifying issue of living with COPD due to breathlessness, which needs urgent help (Gysels et al., 2007). Meanwhile, patients may also feel uncertainty about disease, prognosis, care providers, and support when they are discharged following an exacerbation (Giacomini et al., 2012). In China, patients’ experiences of COPD disease management have been described, such as increased severity of symptoms in morning activities (Lu et al., 2017; Wu et al., 2017), experiencing a stressful life (Yu et al., 2017), feelings of disregard and powerlessness (Tang & Lee, 2017), lack of confidence in community-based services, and a significant burden on caregivers (Yu et al., 2007).

Patients with COPD experience many barriers to participating in active self-management programmes, such as poor emotional states, limitations on their lifestyles and social interactions, and family burdens (Russell et al., 2018), as well as difficulties in defining personalized goals (Hillebregt et al., 2017). Therefore, awareness of the barriers of patients’ motivation is important in developing self-management interventions (Vercoulen, 2012).

**Self-management**

There are different ways to describe the concept of self-management. Clark et al. (1991) defines self-management as the individualized management of symptoms, physical and psychosocial conditions, and health behaviors. Alderson et al. (1999) describe self-management as individualized treatment with learning, case management, and self-efficacy enhancement provided by inter-disciplinary group education. Hence, different researchers have described the concept of self-management with unilateral responsibility of the patient and the health professional. Wilkinson and Whitehead (2009) state that self-management should be carried out in conjunction with family, community, and healthcare professionals, as well as in accordance with the individual’s ability to manage his or her symptoms, treatment, and lifestyle, and the psychosocial, cultural, and spiritual consequences of chronic conditions.
In this thesis, self-management refers to the description of Lorig and Holman (2003) which describe that self-management must be based on patient perceived problems and it evolves into five core skills in self-management: problem solving, decision-making, resource utilization, forming a patient/health care provider partnership and taking action. Problem solving is considered as skills to solve problems, involving problem definition, generating solution strategy by soliciting suggestions from surroundings and health care professionals, strategy implementation and evaluation of the findings. Decision-making is described to make decisions by patients which are based on having sufficient and appropriate information when the disease condition changes suddenly. Resource utilization means seeking out and making use of various direct and potential resources at the same for acquiring enough information. Forming a patient and health care provider partnership is suggested that the roles of health care professionals become teacher, partner and supervisor, and patients must be able to report disease progression, treatment choices accurately to the health care professional in order to discuss together. Taking action needs to combine solution implementation with self-efficacy to make realistic action plans and carrying it out. For self-management of patients with COPD in this thesis, problem solving refers to skills and approaches to improving self-management. Decision-making means mastery of COPD knowledge and sufficient resources to maintain stability and deal with exacerbation. Resource utilization indicates acquiring treatment, rehabilitation information from physicians, nurses, public media (TV, radio), families, friends and other resource. Forming a patient/health care provider partnership mentions sharing information acquired and knowledge learned by themselves with nurse-coach. Taking action refers to achievable specific health-related behavior gradually, such as from reducing the cigarettes to quitting smoking, walking from hundreds of steps to thousands of steps every day.

According to Lorig and Holman (2003), self-efficacy theory is the mechanism which affects self-management behaviors.

**Self-efficacy**

The concept of self-efficacy, which is designed to explain the effects of clinical treatment, is defined as ‘the conviction that one can successfully execute the behavior required to produce the outcomes’ (Bandura, 1977a).
According to this definition, any interventions aimed to affect the target problem should be based on approaches that increase people’s perception of self-efficacy, because self-efficacy influences a person’s choice of activities, behavioral settings, and coping effects.

The self-efficacy theory offers a link between self-perception and actions, which means a person’s beliefs about how his or her own capabilities predict his/her future behaviors (Jeng & Braun, 1994). Self-efficacy has two types of expectancies, efficacy expectation and outcome expectation. Efficacy expectation, which refers to an individual’s perceived ability to perform a behavior, can help a person to determine whether or not to participate in a health-related behavior, how much effort will be expended, and how long the behavior will persist. Outcome expectation is a person’s belief that positive outcomes will result from engaging in health-related behaviors (Bandura, 1977a, 1977b).

Self-management programmes founded on Bandura’s model of self-efficacy (Bandura, 1977a) have shown to be effective in promoting behavioral change (Burckhardt, 2005; Weng et al., 2010) and in helping to maintain and improve the health-related behaviors and health status of patients with chronic conditions (Richardson et al., 2014).

Self-management interventions in COPD

Although COPD self-management interventions have been studied for several years, research regarding self-management in patients with COPD lags considerably behind that of other chronic illnesses (Kaptein et al., 2014). Patients with COPD have problems with self-management, and sociodemographic and clinical factors appear to play a role in this problem, such as smoking, low body mass index (BMI), dyspnea, and low exercise capacity (Bos-Touwen et al., 2015; Effing et al., 2012).

The definition of COPD self-management interventions used in this thesis is: ‘A COPD self-management intervention is structured but personalized and often multi-component, with goals of motivating, engaging and supporting the patients to positively adapt their health behavior(s) and develop skills to better manage their disease’ (Effing et al., 2016).

In a Cochrane systematic review of self-management programme interventions show that they could decrease the hospital admissions of patients with COPD and improve their health-related quality of life (Zwerink et al.,
However, self-management intervention has a small but higher respirator’y-related mortality rate if the influence of comorbidities is not taken into account (Lenferink et al., 2017). Evidence regarding comprehensive self-management programmes has been verified as improving self-efficacy (Ni WI & Smith, 2017) and exercise capacity (Cannon et al., 2016), and as reducing emergency or unscheduled physician visits (Newham et al., 2017) and anxiety (Baker & Fatoye, 2017), as well as all-cause hospitalization (Jonkman et al., 2016). Self-management interventions for COPD were highlighted in the Global Initiative for Chronic Obstructive Lung Disease, as well as in Australian and New Zealand guidelines for the first time in the 2017 report (GOLD, 2017; Yang et al., 2017).

However, due to the diversity of duration and structure of self-management programmes, insufficient data have been obtained to provide clear recommendations for the effective content and structure of self-management programs for COPD (Effing et al., 2012; Majothi et al., 2015; Zwerink et al., 2014). Furthermore, several programmes have reported low patient participation because of poor access to transportation and insufficient perceived benefits, high dropout rates due to the high intensity of such programmes, and physical difficulties or family responsibilities (Fischer et al., 2007; Keating et al., 2011). Furthermore, failure to accept their condition, fear of making a change, lack of adequate support, and guilt about smoking affect participation negatively (Sohanpal et al., 2012). Therefore, it is crucial to take into account the severities and comorbidities of the disease, the expectations of outcomes, the exercise intensity of the programme, feasible access to health care, and individual preferences and social responsibilities when providing self-management interventions.

**Health coaching**

Health coaching, which focuses on patients’ and health professionals’ mutual responsibilities (Kivelä et al., 2014), is an approach to enhance self-management strategies in order to support lifestyle change and prevent exacerbations of chronic illness. The term *health coaching* has been utilized in variety of ways. Palmer et al. (2003) put it forward first in the context of health education and promotion to achieve an individual’s health-related goals. Butterworth et al. (2007) defines it as a service whereby health providers facilitate participants in changing their lifestyle behaviors based on health
promoting goals for improved health and quality of life. Kreitzer et al. (2008) describes it as committing to help a person gain insight and increase self-awareness to sustain healthy behavior. Although these definitions are similar in paying more attention to promoting health-related goals, there is no exact content, such as strategies and delivery methods, to guide health professionals in implementing health coaching, nor are the roles and competence of the health coaches specified. Wolever et al. (2013) explain it as a patient-centred systematic process delivered by health professionals with diverse professional backgrounds in which patients determined their goals to develop accountability in health behaviors and work toward them with a coach.

Health coaching as an intervention method to motivate health-behaviors and improve health has been an effective method with positive effects on lifestyle behavior and self-efficacy, as well as physical and mental health status (Kivelä et al., 2014). It has also been an effective approach in improvement and control of hemoglobin levels among low-income patients with uncontrolled type 2 diabetes, hypertension, and hyperlipidemia (Willard-Grace et al., 2015), and in cancer management (Thomas et al., 2012). In recent years, health coaching has been used in patients with COPD, resulting in reduced COPD readmission within 6 months (Benzo et al., 2016), decreased disease-related healthcare utilization including urgent, emergent, and hospital care (Coulta et al., 2018), and improved disease-specific quality of life (Benzo et al., 2016). However, one study showed that there was no variation or even declines in physical activity among patients with COPD who received a health coaching programme (Benzo et al., 2016), and another study reported that the physical activity of patients with moderate severity remained stable and better than with usual care (Coulta et al., 2016). Different operationalized approaches and practices in health coaching makes it difficult to identify the most effective strategy in chronic disease self-management (Wolever et al., 2013). Therefore, suitable contents with thorough and detailed descriptions based on patients’ health conditions should be explored in the health coaching process.

A nurse-coach, the most common health coach in the world (Olsen, 2014), has been proved to play an important role in supporting the self-management of patients with COPD (Early et al., 2017). Nurse coaching programmes have been shown to have positive effects on clinical outcomes and health status in coronary heart disease high-risk individuals (Huang et al., 2017) and coronary artery disease (Zhang et al., 2017) in China. However, the evidence for health coaching support in COPD is limited in China. One qualitative study in COPD suggests that self-management support should be community based and
patient-centred (Williams et al., 2007), but poor knowledge concerning the control and prevention of COPD among health professionals in community healthcare settings restricts wider delivery to meet the need of patients with COPD in China (Li et al., 2017). Respiratory nurse specialists who are familiar with patients’ medical histories during their hospital stay are considered to be good health coaches after patients’ discharge from hospitals (Li F et al., 2015).

The patient-centred process is the core of health coaching, however, in a systematic review around 40% of the articles did not operationalize health coaching as a process which was fully patient-centred (Wolever et al., 2013) evidenced by participant receiving the same intervention without tailoring or interventions that involved non-individualized instruction or prompting. Most patient-centred studies have been conducted in settings in which visits with healthcare professionals play an important role (Starfield, 2011). The concept of visit-based care builds a relatively short-term relationship, which is unfavorable for mutual trust and medical decision-making. However, another concept, person-centred care, refers to interrelationships over time and extends beyond communication to a long-standing relationship (Starfield, 2011).

**Person-centred care**

The term ‘person’ is the core which is considered to be a part of the social context of a person in relation to his or her surroundings in person-centred care (PCC), which integrates the partner, family, relatives, and friends to promote health (Ekman et al., 2011). McCormack (2006) defines PCC as understanding and sharing knowledge between professionals and patients built on mutual trust. Leplege et al. (2007) describe PCC as involving a shift from passive patients to active participants. Morgan et al. (2012) defines PCC as a holistic approach with biological, social, psychological, and spiritual aspects which delivers respectful and individualized care for persons and empowers them to be involved in health decisions through a therapeutic relationship. Ekman et al. (2011) propose three simple routines to facilitate and safeguard the transition to PCC: 1) the patient narrative is the first step in establishing a partnership with the patient, 2) shared decision making builds on the partnership, and 3) the value of this information is sanctioned by documentation in patient records which contributes to the continuity and transparency of the provider - patient partnership.
PCC has been reported as decreasing symptoms and psychotropic medication use, and improving the quality of life in dementia (Li & Porock, 2014; Sun & Myonghwa, 2017). In Sweden, PCC has shown significant effects among patients with chronic heart failure in decreasing the lengths of their hospital stays (Ekman et al., 2012), rehospitalization (Brännström & Boman, 2014), and in improvements of self-efficacy level after hospitalization for an acute coronary syndrome (Fors et al., 2016; Fors et al., 2017). The implementation of PCC has also shown that it may improve quality of life in cancer treatment and palliative care (Brännström & Boman, 2014; Hansson et al., 2017), and reduce costs and improve the quality of life for patients with hip fracture, chronic inflammatory arthritis, rheumatoid arthritis, and fibromyalgia (Larsson et al., 2014; Larsson et al., 2015; Olsson et al., 2009). However, there is a lack of studies about PCC in COPD in the world.

To ensure that PCC is a systematic and consistent approach to care, Ekman et al. (2011) established routines that initiate, integrate, and safeguard PCC in daily clinical practice. In PCC, treatment, rehabilitation, or care is planned in partnership with health care professionals, and an agreement is documented in the form of a written health plan, containing goals and strategies for short and long-term follow-up. A person’s narrative with a focus on his/her illness, symptoms, and impacts on his/her life should initiate the partnership and constitutes the starting point for PCC. Health care professionals listen to a person’s experience and combine it with medical examinations and tests in order to gain a thorough understanding of the person. The most central component of PCC is the integration or partnership between patients and health care professionals. The second component of PCC is mutual respect for each other’s knowledge and expertise, i.e. the patient and relatives’ expertise in living with the condition, and the health care professional’s expertise in care, treatment, and rehabilitation of the condition. The third component of PCC is the documentation of the patient narrative and health plans, which can safeguard the partnership. Patient preferences, beliefs, values, involvement, and decision-making can be documented, which facilitates the continuity in care following the patient’s route.

Compared to ‘patient’, person is more constantly in the lifespan. In this thesis, the term of ‘patient’ is used to describe the participants who are recruited in the study because the essence of PCC is not met, but we apply the routines of PCC to guide the nurse-coach in conducting the health coaching.
Rationale for the thesis

COPD is the fourth leading cause of death in the world and is expected to be the third leading cause of death by 2020. It is also a primary reason for chronic morbidity that contributes to higher economic and social burdens on patients and families. In China, smoking habits, air pollution from industrial and traffic emissions, and indoor air pollution from biomass cooking and heating are leading to an increasing incidence of COPD.

Self-management education as one approach of non-pharmacological treatments was recently highlighted in the report of the Global Initiative for Chronic Obstructive Lung Disease (GOLD). One recent Cochrane systematic review reported that self-management intervention can improve quality of life and reduce hospital readmission. However, there is shortage of disease-specific self-management intervention for patients with COPD in China.

Health coaching, as an emerging promising intervention method which motivates patients to be active participants in self-management by interacting with healthcare professionals, has been shown to be effective in health outcomes for patients with COPD in developed countries. However, no study has been performed evaluating a systematic and structured health coaching COPD programme to support self-management in China. Hence, an evaluation of the effectiveness of an approach with health coaching to improve self-management of patients with COPD in China is necessary.
Aims

The overall aim of this thesis was to explore sociodemographic and clinical factors influencing self-management and to test and evaluate a Health Coaching Self-Management Programme for patients with COPD in China.

The specific aims of the different studies were as follows:

- To examine the status of self-management in patients with COPD and its associations with sociodemographic and clinical variables (I).

- To evaluate the effects of a health coaching self-management programme on lung function, physical activity and quality of life in patients with COPD (II).

- To evaluate the effects of a health coaching self-management programme intended to improve self-management skills and psychological status for patients with COPD (III).

- To describe the experiences of patients with COPD participating in a health coaching self-management program (IV).
Methods

Design

The studies’ designs were explorative, prospective, and longitudinal, with both quantitative and qualitative approaches. More specifically, a cross-sectional approach was used to explore the self-management status of patients with COPD and examine associations with socio-demographic and clinical variables (I). A prospective randomized controlled trial was conducted to study the longitudinal effects of a health coaching self-management programme for patients with COPD (II & III). A qualitative study applying an inductive content analysis was used to describe participants’ experiences with the health coaching self-management programme for patients with COPD (IV). An overview of the methodological procedures is shown in Table 1.

Table 1. Overview of the methodological procedures

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Data collection</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>An explorative study with a cross-sectional approach</td>
<td>154 participants with COPD</td>
<td>Self-reported questionnaires</td>
<td>Stepwise regression model</td>
</tr>
<tr>
<td>II and III</td>
<td>Randomized Control Trial</td>
<td>97 participants with COPD in the intervention and control groups</td>
<td>Self-reported questionnaires and clinical tests</td>
<td>Repeated-measures analysis of variance model</td>
</tr>
<tr>
<td>IV</td>
<td>An explorative qualitative study with an inductive approach</td>
<td>20 participants with COPD</td>
<td>Individual semi-structured interviews</td>
<td>Qualitative content analysis</td>
</tr>
</tbody>
</table>

Participants and setting (I)

This study was conducted as a cross-sectional study at respiratory departments at three general hospitals and one specialized hospital in one
northern city of China. Approximately 250 patients with COPD were asked to participate in the study from September 2014 to March 2015. A convenience sample of 178 patients accepted and was recruited in the study. According to the principle of sample size in multi-factor analysis, 5–10 patients were recruited for each variable (Jin & Cao, 2003). There were 16 independent variables to be analysed. Hence, 154 patients were included in the study (20 failed to complete the questionnaires and 4 questionnaires were invalid). The inclusion criteria were: (1) FEV₁/FVC < 70%, diagnosis of COPD according to the GOLD criteria (Vestbo et al., 2013), (2) willingness to participate, (3) clear consciousness, (4) Mandarin-speaking and able to communicate. The exclusion criteria were: (1) other severe pulmonary and/or cardiac disease, (2) another disorder or progressive disease that seriously influenced daily life.

Participants and setting (II & III)

Patients hospitalized due to COPD at two hospitals in one northern city of China from September 2015 to September 2016 were asked to participate in the study. The inclusion criteria were diagnosis of COPD, age over 40 years, a ratio of forced expiratory volume in 1 second (FEV₁) to forced vital capacity (FVC) < 0.7, either symptomatic COPD defined as an acute exacerbation leading to unscheduled health care attendance within the past year or post bronchodilator FEV₁ < 80% predicted (GOLD criteria), willingness to participate and able to read and write Mandarin. They also had to be able to be reached by telephone or through regular re-examination or home visits post-discharge. The exclusion criteria were life-threatening comorbidity, major psychological illness, and living outside the catchment area.

The sample size was calculated based on one instrument of evaluating quality of life with COPD clinical questionnaire (CCQ) (Zhong, 2009). A sample of 44 patients per group would be required to detect a between-group 0.60 minimal clinically important difference at the 5% significance level and 80% power (Alma et al., 2016).

In total, 97 patients who were in accordance with inclusive criteria agreed to and were recruited to the study, and 12 (12.4%) participants dropped out of the study. The study protocol was approved by the local ethics committee of Tianjin Medical University, China (TMUEC201400201). Prior to the recruitment, written informed consent was obtained from each participant.
Figure 1 illustrative the Consolidated Standards of Reporting Trials (CONSORT) flow diagram.

Patients admitted into hospital (n = 205)

Excluded (n = 108)
- Did not meet inclusion criteria (n = 66)
  - Life-threatening comorbidities: pulmonary embolism (5), cancer (8), severe pulmonary heart disease (36)
  - Residency outside the city (17)
- Declined to participate (n = 42)

Randomised (n = 97)

Allocated to intervention group (n = 48)
Allocated to control group (n = 49)

Follow-up
- First face-to-face coaching (in hospital)
- Telephone coaching (every month during 6 months after discharge)
- No active coaching from 7 to 12 months
- Lost to follow-up (n = 3)
  - Death (n = 1)
  - Could not be contacted (n = 2)
- No active coaching within 12 months
  - Lost to follow-up (n = 9)
    - Death (n = 2)
    - Could not be contacted (n = 5)
    - Moved to other place (n = 2)

Analysis
- Analysed at baseline, 6th weeks, 6th and 12th months after discharge (n = 45)
- Analysed at baseline, 6th weeks, 6th and 12th months after discharge (n = 40)

Figure 1 Study flow diagram of randomised controlled trial of health coaching self-management programme among patients with COPD
Participants and setting (IV)

Participants (n=20) who had taken part in a health coaching self-management programme were asked to participate in this study. A purposive sampling strategy was used regarding the participants’ gender, age, educational level, work, and severity of disease (Table 2). The inclusion criteria were as follows: (1) FEV1/FVC <70% diagnosis of COPD according to the GOLD criteria (Vestbo et al., 2013), and (2) fulfilment of the entire six-month health coaching programme. The exclusion criteria were as follows: (1) acutely exacerbated COPD, and (2) patients who were unable to participate in an interview due to their physical condition or timing issues.

Table 2 Sociodemographic and clinical characteristics of the 20 participants

<table>
<thead>
<tr>
<th>No</th>
<th>Gender</th>
<th>Age</th>
<th>Educational level(a)</th>
<th>Work(b)</th>
<th>Severity of disease(c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>69</td>
<td>Medium</td>
<td>White collar</td>
<td>GOLD IV</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>78</td>
<td>High</td>
<td>White collar</td>
<td>GOLD III</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>55</td>
<td>Medium</td>
<td>Blue collar</td>
<td>GOLD IV</td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>62</td>
<td>High</td>
<td>White collar</td>
<td>GOLD II</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>73</td>
<td>Medium</td>
<td>Blue collar</td>
<td>GOLD IV</td>
</tr>
<tr>
<td>6</td>
<td>Male</td>
<td>65</td>
<td>Medium</td>
<td>White collar</td>
<td>GOLD IV</td>
</tr>
<tr>
<td>7</td>
<td>Male</td>
<td>67</td>
<td>Medium</td>
<td>Blue collar</td>
<td>GOLD II</td>
</tr>
<tr>
<td>8</td>
<td>Male</td>
<td>72</td>
<td>Medium</td>
<td>White collar</td>
<td>GOLD II</td>
</tr>
<tr>
<td>9</td>
<td>Female</td>
<td>73</td>
<td>Medium</td>
<td>White collar</td>
<td>GOLD II</td>
</tr>
<tr>
<td>10</td>
<td>Male</td>
<td>63</td>
<td>Medium</td>
<td>Blue collar</td>
<td>GOLD II</td>
</tr>
<tr>
<td>11</td>
<td>Male</td>
<td>74</td>
<td>Low</td>
<td>Blue collar</td>
<td>GOLD IV</td>
</tr>
<tr>
<td>12</td>
<td>Male</td>
<td>75</td>
<td>Medium</td>
<td>Blue collar</td>
<td>GOLD IV</td>
</tr>
<tr>
<td>13</td>
<td>Female</td>
<td>75</td>
<td>Low</td>
<td>Blue collar</td>
<td>GOLD III</td>
</tr>
<tr>
<td>14</td>
<td>Male</td>
<td>61</td>
<td>Medium</td>
<td>Blue collar</td>
<td>GOLD II</td>
</tr>
<tr>
<td>15</td>
<td>Female</td>
<td>72</td>
<td>Medium</td>
<td>Blue collar</td>
<td>GOLD III</td>
</tr>
<tr>
<td>16</td>
<td>Male</td>
<td>69</td>
<td>Medium</td>
<td>White collar</td>
<td>GOLD III</td>
</tr>
<tr>
<td>17</td>
<td>Male</td>
<td>71</td>
<td>High</td>
<td>White collar</td>
<td>GOLD III</td>
</tr>
<tr>
<td>18</td>
<td>Male</td>
<td>69</td>
<td>Low</td>
<td>Blue collar</td>
<td>GOLD IV</td>
</tr>
<tr>
<td>19</td>
<td>Female</td>
<td>78</td>
<td>Low</td>
<td>White collar</td>
<td>GOLD II</td>
</tr>
<tr>
<td>20</td>
<td>Female</td>
<td>52</td>
<td>Medium</td>
<td>White collar</td>
<td>GOLD IV</td>
</tr>
</tbody>
</table>

\(a\)Low: Elementary school or low vocational education; Medium: secondary school or intermediate vocational education; High: higher vocational education or university.

\(b\)Blue collar: manual worker before retirement; White collar: clerical worker before retirement. \(c\)GOLD: Global Initiative for Chronic Obstructive Lung Disease. GOLD II: FEV1/FVC < 70%, 50% ≤ FEV1% < 80% predicted. GOLD III: FEV1/FVC < 70%, 30% ≤ FEV1% < 50% predicted. GOLD IV: FEV1/FVC < 70%, FEV1% < 30% predicted. FEV1/FVC: Forced expiratory volume in one second/forced vital capacity.
Procedures

In Study I, the patients completed the questionnaires which were assisted by a research assistant in the ward. In Studies II & III, when the patients agreed to take part in the intervention study, the researcher used an online, computer-generated, simple binomial randomization programme to include them in one of the two groups, stratified by centre. Both groups received usual care which focused on the therapy of disease according to physicians’ prescriptions for medication and lifestyle guidance from hospital nurses during the hospital admission. In addition to this, a 6-month health coaching self-management intervention was conducted in the intervention group. Long-term effects were also evaluated until the 12-month follow-up. In study IV, semi-structured interviews were conducted with some of the participants who had completed the intervention programme.

Health coaching self-management intervention (II & III)

Participants who were assigned to the intervention group received a combination of one face-to-face coaching (in hospital) and monthly telephone coaching over 6 months (after discharge) (Table 3).

Smoking cessation (for current smokers). Motivational messages and behavior-change techniques, such as consequences of smoking, how to quit and stay quit, were provided in the booklet. Participants were encouraged to set a goal with the coach to make a plan for smoking cessation in the face-to-face coaching. The nurse-coach, who would encourage participants to persevere with quitting and praise their success in cessation, also encouraged participants to identify the challenges of quitting and plan how to overcome them.

Medication management. The nurse-coach explained in great detail the functions of the medicines and inhaler techniques. If participants reported difficulties in remembering or how to take their medications, the coach demonstrated the procedure again and encouraged participants to self-monitor their behaviors, such as using a medication box or alarm for a reminder, or to seek support from their partners.
Table 3. The routines and contents of the programme

<table>
<thead>
<tr>
<th>Routines</th>
<th>Contents of the programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Patients’ narrative about their everyday life and symptoms, disease knowledge with prevention, treatment, and rehabilitation, their resources, and their beliefs, values, and health goals were assessed in face-to-face discussions between the patient and nurse-coach before discharge. Participants’ self-management skills, physical activity, lung function, quality of life, and psychological status were also assessed by a research assistant. Afterwards, within 24 hours, all the information and plans were summarized and written in the self-management booklet regarding COPD and a health diary to record their health behaviors, including daily breathing exercises, medication management, smoking status, and types and duration of daily exercise.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Patient and nurse-coach discussed the health plan and reached an agreement. Shared responsibilities between the patient and coach to improve the patient’s health status were determined. Furthermore, patients were encouraged to use a pedometer delivered by the coach to monitor and record their physical activity and favourite exercise by step counts, increasing the steps gradually every week.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Monthly telephone coaching for 6 months to safeguard the partnership provided the patient with resources to enable implementation of the plan without barriers. In the telephone follow-up, the patient and the nurse-coach evaluated improvements in the programme, adapted the contents of programme, and made changes according to the patient’s symptoms and individual needs. The nurse-coach also provided further guidance by telephone coaching based on the condition of the disease, mastery of disease knowledge, and the participant’s adherence, attitude, and thoughts.</td>
</tr>
</tbody>
</table>

**Breathing exercise.** Abdominal and pursed-lip breathing were involved in the exercise (Reid & Loveridge, 1983). The methods and techniques of the breathing control exercise were demonstrated by the nurse-coach, who gave them a video if they wanted. Patients inhaled through the nose over several seconds with the mouth closed and then exhaled slowly over
4 to 6 seconds through pursed lips held in a whistling or kissing position, accompanied by the relaxation and contraction of the abdominal muscles (Faling, 1986). The patients were recommended to perform the breathing exercise 2–3 times daily for 10–15 minutes each time. The breathing exercise was individualized to maximize personal functional gains.

*Physical activity.* A pedometer was used to monitor the physical activity of patients. In terms of the promotion of physical activity, aims for the participants achieved the national recommendation of at least 150 minutes of moderate-intensity physical activity each week (Zhao, 2011). The first coaching focused on uptake of physical activity, reduction of inactivity, enhancement of motivation and self-efficacy for physical activity plans, and feelings and fears about physical activity goals, particularly in relation to breathlessness. The coach discussed with participants the types of physical activity which they liked, such as walking, jogging, yoga, Qi Gong, and Tai Ji. The coach shared the decision with the participants about the exercise intensity based on the severity of the disease. Every participant took a pedometer, which could record step counts, meters, and calories, to be used as a motivational tool and to assist participants in quantifying the amount of activity they were achieving each day/week.

*Control group*

Each participant received general health education on pharmacological treatment from the chief physician and health-related behavior guidance, such as smoking cessation, taking appropriate exercise, prevention of colds, and regular rechecks from the responsible nurse when they were discharged from hospital. There was no further regular follow-up after discharge in the control group.
Data collection

Cross-sectional study (I)

The patients completed the questionnaires in the ward, which had been handed out by a research assistant who had information from the researchers about how to instruct the participants to complete the questionnaires. The socio-demographic and clinical data were obtained from patients and medical records. The questionnaires took 20–30 minutes to complete.

COPD Self-Management Scale (CSMS)

The COPD Self-Management Scale (CSMS) is the first scale for evaluating the self-management status of patients with COPD. It contains 51 items and the response to each item is graded on a 5-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always) (Zhang et al., 2013). The total score ranges from 51 to 255, and the higher the score, the better the self-management level. The CSMS involves five domains: symptom management, 8 items (40 points); daily-life management, 14 items (70 points); emotion management, 12 items (60 points); information management, 8 items (40 points); and self-efficacy, 9 items (45 points). A score > 160 points indicates a high level of self-management, scores from 144 to 160 points indicate a moderate level, and scores < 144 points indicate a low level. The standardized score for each domain is calculated as the respective domain score divided by the number items in order to facilitate comparison among each domain. The test-retest correlation coefficient, Cronbach’s α, and split-half reliability coefficient of the CSMS for patients with COPD were 0.87, 0.92, and 0.90, respectively (Zhang et al., 2013). In Study I, the value of Cronbach’s α for the CSMS was 0.86.

Socio-demographical and clinical variables

The variables included gender, age, living conditions, family support, education level, career, salary, economic burden, smoking status, and BMI. The level of medication adherence and home oxygen therapy was measured by the questions: ‘Do you take medicine on time in accordance with prescription?’ and ‘Do you use oxygen therapy at home?’ The response alternatives were ‘yes’ and ‘no.’ Other independent variables, including severity of COPD and frequency of acute exacerbation of symptoms in the
last year, were obtained from medical records. Functional dyspnea was rated using a modified Medical Research Council (mMRC) Dyspnea Scale ranging from 0 (not troubled with breathlessness except with strenuous exercise) to 4 (too breathless to leave the house or breathless when dressing or undressing) (Celli & MacNee, 2004). The level of physical activity was measured by the question ‘How much physical activity do you have per day?’ The answering alternatives were: 1: never; 2: less than 30 minutes; 3: more than 30 minutes.

**Intervention study (II–IV)**

Quantitative data were collected by self-reported questionnaires and clinical tests. Qualitative data were collected by interview.

**Quantitative data (II & III)**

All of the instruments in the intervention and control group were administrated at baseline, 6th week, 6th month, and 12th month post-discharge. Follow-up data were collected at the out-patient department or participants’ home. A total of 97 participants were recruited in the programme (48 in the intervention group and 49 in the control group), and 85 patients (45 in the intervention group and 40 in the control group) accomplished the programme and were followed up in 1 year. Two research assistants blinded to the groups were responsible for collecting all of the data.

**COPD Self-Management Scale (CSMS)**

CSMS contains 51 items and the response to each item is graded on a 5-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always) (Zhang et al., 2013). The total score ranges from 51 to 255, and the higher the score, the better the self-management level. The CSMS involves five domains: symptom management, 8 items (40 points); daily-life management, 14 items (70 points); emotion management, 12 items (60 points); information management, 8 items (40 points); and self-efficacy, 9 items (45 points). A score > 160 points indicates a high level of self-management, scores from 144 to 160 points indicate a moderate level, and scores < 144 points indicate a low level. The test-retest correlation coefficient, Cronbach’s $\alpha$, and split-half
reliability coefficient of the CSMS for patients with COPD were 0.87, 0.92, and 0.90, respectively (Zhang et al., 2013).

Lung function
A portable MicroLoop Spirometer (Jaeger, made in Germany) was used to test lung function. The index included FEV$_1$% and FVC%. These data were measured in the hospital ward using calibrated spirometers and assessed in accordance with American Thoracic Society criteria (Carrie et al., 2014). Participants were seated comfortably, the device was placed in the mouth, and the nose was blocked by hand to prevent nose ventilation. The patient was then instructed to make an explosive, fast, deep breath to generate the maximal expiratory flow volume (MEFV) curve; this was repeated three times (Celli et al., 2004).

The Global Physical Activity Questionnaire (GPAQ)
The 19-question GPAQ-C was adapted from the Global Physical Activity Questionnaire developed as part of the WHO STEPwise Approach to Chronic Disease Risk Factors Surveillance. The GPAQ-C evaluates the activities of the work domain (vigorous and moderate intensity), the transportation domain (walking and cycling for transportation), and the leisure-time domain on a scale ranging from 0.67–0.85. The partial correlation coefficients for the 7-day PA-log ranged from 0.21 to 0.57 on the GPAQ-C (Hu et al., 2011).

1min Sit-to-Stand Test (1min-STST)
The 1min-STST is an effective measurement to test the efficiency of pulmonary rehabilitation (Vaidya et al., 2016). Using the STS test protocol (Ozalevli et al., 2007), trained research assistants ask patients to sit down on a chair (height 46–48 cm) without arm rests, keep their legs apart with about 90-degree knee flexion and aligned with their hips, and hold their hands stationary on their hips. The research assistants instructed patients about the duration of the test (1 min) and asked them to do as many repetitions as possible at a self-paced speed, allowing for short breaks if needed but without using the arms for support. They started the test by giving the command ‘attention, ready, go’. When 15 seconds were left, patients were told ‘You have 15 seconds left until the test is over’. 1min STST test is reliable and valid for measuring functional exercise capacity in patients with COPD, with intraclass correlation coefficients of 0.93 and 0.99 for reliability (Crook et al., 2017).
Handgrip strength

Grip strength was tested with a grip meter (WCS-100; Nantong Beisite Industry Co., Ltd, Jiangsu, China). Patients were seated with their shoulders adducted, elbows flexed to 90°, and forearms in a neutral position. Trained research assistants then instructed patients to squeeze the handle as much as possible and read to the nearest kilogramme where the needle stopped. As recommended, we used the best of the six measurements (three times for each hand) for the statistical analyses (Roberts et al., 2011).

Quality of life

Quality of life was measured using the COPD Clinical Questionnaire (CCQ), which has been developed as a COPD-specific health status measurement using data from primary and secondary care patients (Van et al., 2003). The CCQ consists of 10 questions in three domains: symptoms, mental state, and functional state. Questions are scored on a scale of 0–6, with a higher score representing worse quality of life. The test-retest correlation coefficient and Cronbach’s $\alpha$ of the CCQ were 0.94 and 0.91, respectively (van der Molen et al., 2003).

Anxiety and depression

Anxiety and depression status were measured using the Chinese version of the Hospital Anxiety and Depression Scale (HADS). It consists of 14 items, depression (7 items) and anxiety (7 times), each with four choices numbered alphabetically. Each of the subscales’ scores ranges from 0 to 21, corresponding to total scores of 0 to 42, with higher scores indicating greater distress. Score 0-7 indicate normal or no anxiety/depression, 8-10 mild, 11-14 moderate, and 15 to 21 indicate severe anxiety/depression (Snaith et al., 1994). The Cronbach’s $\alpha$ of the Chinese-version HADS-A and HADS-D subscales had values of 0.81 and 0.74, respectively (Leung et al., 1993).

Qualitative Data (IV)

The interviews were conducted from May 2016 to October 2016. Two pilot interviews were performed by the first author to test the interview guide. One question on the influence on family or friends was added to the interview guide, and the pilot interviews were considered appropriate for inclusion in the analysis. The other participants were interviewed at their homes or at an outpatient clinic by two nurses with interviewing experience using a semi-
structured interview guide. The interviews lasted 25–71 minutes and started with an opening question: ‘Could you describe your experiences in the programme you participated in?’ The participants were encouraged to describe their experiences in the programme, to reflect on their involvement in the process, and to identify the facilitating factors or barriers to their participation in the programme. Different follow-up questions were asked depending on the answer to this question. At the end of the interview, the participants were encouraged to propose suggestions to improve the programme. The interviews were taped with a digital voice recorder and transcribed verbatim.

Data analysis

Quantitative analysis (I–III)

In Study I, data were analysed using SPSS for Windows Version 17.0 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to illustrate the characteristics of the study participants. Categorical variables were shown with frequencies and percentages and continuous variables as mean and standard deviation when normally distributed. Spearman’s correlation coefficient ($r$) was used for univariate correlation analysis to find the correlations between independent variables (such as gender, age, living conditions, family support, educational level, career, salary, economic burden, smoking status, BMI, medication adherence, home oxygen therapy, severity of COPD, frequency of acute exacerbation of symptoms, functional dyspnea, and level of physical activity) and self-management level. Further, for the development of a final regression model, a stepwise approach was used, choosing variables that had a $p$-value of $< 0.05$ in the univariate correlation analysis. The level of statistical significance was set at $p < 0.05$ and all tests were two-tailed.

In Studies II and III, the data were analysed using SPSS for Windows version 22.0 software (SPSS Inc., Chicago, IL, USA), with the level of statistical significance set at $p < 0.05$. Data were presented as mean and SD or frequency and percent for continuous and categorical variables, respectively. Between-group comparisons were used independent samples $t$-tests and chi-square test for continuous and categorical variables. In within-group analysis, a paired samples $t$-test was used. For co-primary and process
outcomes, repeated-measures analysis of variance (ANOVA) models were used to compare mean differences between the intervention and control groups over time.

The repeated-measures model for longitudinal data analysis optimized the analysis of all of the data available at each time point. That is, if a participant dropped out at the 6th month, then the model incorporated data available for the baseline and 6th week time points. Regardless of missing data, participants were assigned to the group to which they were as randomized. The variables with group, time, and group-by-time interactions were included in the models. The statistical significance of the interaction term is of primary interest and determines whether or not the group means were changing at different rates for the outcomes. We did not compare the dropouts and observed multicollinearity of predictors using the variance inflation factor cut-off. Some variables which are missing less than 3 times were excluded from the analysis. For those missing one time in the follow up the authors used the mean value within the group (intervention or control) to represent the missing data at that time.

**Inductive qualitative content analysis (IV)**

The interviewer reviewed the transcripts by listening to the tape recording to ensure its accuracy. The transcripts were analysed using inductive qualitative content analysis (Elo & Kyngas, 2008). The first three interviews were translated into English to allow a thorough discussion among the authors about the emerging meaning units. Afterward, only the meaning units were translated from the other 17 interviews. The data analysis process included open coding, creating categories, and abstraction (Elo & Kyngas, 2008). In open coding, the written text was reread several times and a general sense of the participants’ experiences was recorded in the transcript margins as notes or headings. After open coding, the notes and headings were collected from the margins and transferred to a coding sheet, where similar notes and headings were grouped together to generate higher-order headings. Similar higher order headings were then collected on a separate sheet for analysis and subcategories were identified. Through abstraction, similar experiences in the subcategories were grouped on a separate sheet and categories were generated. The authors continuously repeated the abstraction process for as long as reasonable categories emerged.
Ethical considerations

Permission to carry out the whole study was granted by Tianjin Medical University Ethics Committee (TMUEC201400201) and the study was conducted in accordance with the Declaration of Helsinki (WMA, 1964). The ethical principles: autonomy, beneficence, non-maleficence and justice, were taken into consideration (Buchanan, 2006).

Autonomy

The concept of autonomy refers to a person’s right to self-determination (Polit & Beck, 2016). In the thesis, patients in all the studies received both verbal and written information about the study in detail and were asked to sign an informed consent document by professional nurses in the hospital prior to participating. Written informed consent included the aim of each study, inclusion and exclusion criteria for the patients, the anticipated benefits and potential risks of the study, the confidentiality of the individual recordings, and the right to refuse to participate and withdraw at any time in the process of the study, as well as stating that the care received would not be affected by their decision to participate. There was a risk that patients might feel obligated to participate because medical professionals invited them, but they were repeatedly informed that it was entirely voluntary. Some patients declined to participate in Studies I-III and there were dropouts in Studies I-III, which support the conclusion that participation was perceived as voluntary.

Beneficence and Non-Maleficence

The principle of beneficence and non-maleficence is intended to maximize benefits and minimize the risk of harm (Polit & Beck, 2016). In Studies II and III, the benefits for the patients were the opportunity to participate in an intervention which could decrease their symptoms and improve self-management, physical activity, and awareness of the disease and quality of life, which were good for their therapy and rehabilitation.
The participants in the control group also received concern and encouragement from research assistants when collecting data. Benefits might also include a good feeling from expressing their experiences and perceptions of the intervention in order to have an influence on further development (study IV). It was a good opportunity for patients to share their opinions with health professionals who seldom had time to listen to their narratives.

To minimize the risk of harming the patients, assurance of confidentiality was given by coding the participants’ information with numbers in the studies I–IV, and only researchers had access to the identities of the patients. Furthermore, no individual was identifiable in the result of Studies I–IV. In Study I, no questions could be considered as being sensitive for the patients. In Studies II and III, all the contents of intervention involved share-making between coach and patients, which increased the acceptance by the participants. Furthermore, the patients could withdraw from the intervention at any time. In Study IV, none of patients said that their privacy had been violated during the interview; in contrast, some participants expressed their gratitude for their coach’s care and patience.

Justice

The concept of justice is the right to fair treatment for all patients (Polit & Beck, 2016). In my thesis, all of the studies (I–IV) asked permission of all the patients who met the inclusion criteria. The intervention (Studies II and III) was a randomized controlled trial, which meant that every patient had an equal chance of being allocated to the intervention or control group, and the care of the patients who declined to participate the intervention was not affected in the regular therapy. However, the inclusion criteria excluded patients who suffered from very severe complications because they cannot manage their disease by themselves. In Study IV, the interviews were conducted by two nurses who worked at the respiratory department in two hospitals where the patients were recruited. Both of them were trained in advance to ask the same questions following the same outlines of an interview. However, all of the interviewees knew the interviewers were the nurses who might take care of them in hospital, which might have had an effect on interviewees’ willingness to share their worse experiences.
Results

Influencing factors associated with self-management among patients with COPD

The mean age of the 154 subjects (60% men) was 72.8 ± 9.6 years. Nearly half (43%) of the subjects had a high level of self-management, 27% had a moderate level, and 30% had a low level. Self-management was rated highest in daily life management, emotion management, and self-efficacy, and lowest in information management (Table 4).

Table 4. Self-management and each domain of patients with COPD ($n = 154$)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Score</th>
<th>Standard score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>Self-management</td>
<td>157.19 ± 23.86</td>
<td></td>
</tr>
<tr>
<td>Symptom management</td>
<td>23.59 ± 5.64</td>
<td>2.95 ± 0.71</td>
</tr>
<tr>
<td>Daily-life management</td>
<td>45.81 ± 8.39</td>
<td>3.27 ± 0.60</td>
</tr>
<tr>
<td>Emotion management</td>
<td>38.79 ± 7.64</td>
<td>3.23 ± 0.64</td>
</tr>
<tr>
<td>Information management</td>
<td>20.06 ± 7.42</td>
<td>2.51 ± 0.93</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>28.94 ± 6.10</td>
<td>3.22 ± 0.68</td>
</tr>
</tbody>
</table>

Standard score: each domain score was divided by the number of items.

Influencing factors associated with self-management among patients with COPD are shown in Table 5. In the stepwise multiple linear regression analysis, physical activity, salary, and age were selected as self-management predictors, explaining 21.0% of the variance.
Table 5. Multiple linear regression analysis of self-management in patients with COPD

<table>
<thead>
<tr>
<th>Self-Management Versions</th>
<th>Variables</th>
<th>$R^2$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Management Scale</td>
<td>Constant</td>
<td>10.837</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical activity</td>
<td>3.770</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salary</td>
<td>0.210</td>
<td>3.192</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td>−2.899</td>
<td>0.004</td>
</tr>
<tr>
<td>Symptom Management</td>
<td>Constant</td>
<td></td>
<td>20.994</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>HOT</td>
<td>0.343</td>
<td>7.269</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>MP</td>
<td></td>
<td>3.267</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>Smoking status</td>
<td></td>
<td>−2.644</td>
<td>0.009</td>
</tr>
<tr>
<td>Daily-life Management</td>
<td>Constant</td>
<td></td>
<td>11.165</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Physical activity</td>
<td></td>
<td>6.212</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0.273</td>
<td>−3.421</td>
<td>0.001</td>
</tr>
<tr>
<td>Emotional Management</td>
<td>Constant</td>
<td></td>
<td>7.347</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Physical activity</td>
<td></td>
<td>2.932</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>BMI</td>
<td>0.141</td>
<td>2.617</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>Salary</td>
<td></td>
<td>2.561</td>
<td>0.011</td>
</tr>
<tr>
<td>Information Management</td>
<td>Constant</td>
<td></td>
<td>9.252</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Education level</td>
<td>0.127</td>
<td>4.016</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>HOT</td>
<td></td>
<td>2.343</td>
<td>0.020</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Constant</td>
<td></td>
<td>11.576</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Physical activity</td>
<td></td>
<td>2.789</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Salary</td>
<td>0.267</td>
<td>3.136</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>Dyspnoea</td>
<td></td>
<td>−3.017</td>
<td>0.003</td>
</tr>
</tbody>
</table>

HOT: home oxygen therapy; MP: follow the medicine prescription

Effects of a health coaching self-management programme

There were no significant differences in demographic and clinical characteristics at baseline between intervention and control group (Table 6).
Table 6. Baseline demographic and clinical characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention (n = 48)(SD/%)</th>
<th>Control (n = 49)(SD/%)</th>
<th>χ²/t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>35(62.9)</td>
<td>30(61.2)</td>
<td>−1.218</td>
<td>0.223</td>
</tr>
<tr>
<td>Female</td>
<td>13(27.1)</td>
<td>19(38.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>45(93.8)</td>
<td>42(85.7)</td>
<td>−1.295</td>
<td>0.195</td>
</tr>
<tr>
<td>Divorced/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>widower</td>
<td>3(6.2)</td>
<td>7(14.3)</td>
<td>−1.295</td>
<td>0.195</td>
</tr>
<tr>
<td>Living conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spouse or child</td>
<td>45(93.7)</td>
<td>42(85.7)</td>
<td>−1.295</td>
<td>0.195</td>
</tr>
<tr>
<td>Alone</td>
<td>3(6.3)</td>
<td>7(14.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>28(58.4)</td>
<td>33(67.3)</td>
<td>−0.896</td>
<td>0.370</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>15(31.2)</td>
<td>12(24.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>5(10.4)</td>
<td>4(8.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White collar</td>
<td>25(52.1)</td>
<td>21(42.6)</td>
<td>−0.905</td>
<td>0.365</td>
</tr>
<tr>
<td>Blue collar</td>
<td>23(47.9)</td>
<td>28(73.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 1500</td>
<td>5(10.4)</td>
<td>11(25.5)</td>
<td>−1.246</td>
<td>0.213</td>
</tr>
<tr>
<td>1501–3000</td>
<td>24(50.0)</td>
<td>22(44.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 3001</td>
<td>19(39.6)</td>
<td>16(32.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience of economic burden</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>22(45.8)</td>
<td>11(22.4)</td>
<td>−1.506</td>
<td>0.132</td>
</tr>
<tr>
<td>Moderate</td>
<td>6(12.5)</td>
<td>15(30.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>20(41.7)</td>
<td>23(47.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>14(29.2)</td>
<td>12(24.5)</td>
<td>−0.407</td>
<td>0.684</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex-smoking</td>
<td>24(50)</td>
<td>26(53.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>10(20.8)</td>
<td>11(22.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking index</td>
<td>1113.29(1293.43)</td>
<td>722.73(460.44)</td>
<td>1.725</td>
<td>0.089</td>
</tr>
<tr>
<td>Alcohol status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>25(52.1)</td>
<td>32(65.3)</td>
<td>−1.458</td>
<td>0.145</td>
</tr>
<tr>
<td>Ex-smoking</td>
<td>15(31.3)</td>
<td>13(26.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>8(16.7)</td>
<td>4(8.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>22(45.8)</td>
<td>23(46.9)</td>
<td>−0.109</td>
<td>0.914</td>
</tr>
<tr>
<td>yes</td>
<td>26(54.2)</td>
<td>26(53.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exacerbation in last year</td>
<td></td>
<td></td>
<td>−0.387</td>
<td>0.700</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung Disease</td>
<td>14(29.2)</td>
<td>9(18.4)</td>
<td>4.804</td>
<td>0.684</td>
</tr>
<tr>
<td>Cardiac Disease</td>
<td>18(37.5)</td>
<td>22(44.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>1(2.1)</td>
<td>11(22.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

aLow: Elementary school or low vocational education; Medium, secondary school or intermediate vocational education; High: Higher vocational education or university.
bBlue collar: Manual worker; White collar: Clerical worker.
**Self-management**

The interaction effect between time and group (control or intervention) for self-management showed that the intervention group improved significantly compared to the control group in all five dimensions: Symptom management \((p < 0.001)\), Daily life management \((p < 0.001)\), Emotion management \((p < 0.001)\), Information management \((p < 0.001)\) and Self-efficacy \((p < 0.001)\). At the 6-week and 6- and 12-month points, all of the dimensions were significantly better in the intervention group (Table 7).

**Physical activity**

The interaction effect between time and group (control or intervention) for physical activity showed that the intervention group improved significantly compared to the control group in three aspects, GPAQ \((p = 0.001)\), 1minute STS \((p = 0.005)\), and Grip strength \((p < 0.001)\). Grip strength was significantly better in the intervention group at all measurement points, 1minute STS was significantly better in the intervention group at 6- and 12-month, and GPAQ was significantly better in the intervention group at 12-month (Table 8).

**Lung function**

The interaction effect between time and group (control or intervention) for lung function showed that the intervention group improved significantly compared to the control group in two measures, FEV1\% \((p = 0.003)\) and FVC\% \((p = 0.001)\). At 6- and 12-months, FVC\% was significantly better in the intervention group. However, there were no significant differences in at any time point (Table 8).

**Quality of life**

The interaction effect between time and group (control or intervention) for quality of life showed that the intervention group improved significantly compared to the control group in all three measures and in total score, CCQ-symptom \((p < 0.001)\), CCQ-emotion \((p < 0.001)\), CCQ-activity \((p < 0.001)\), and CCQ \((p < 0.001)\). At all measurement points, CCQ-emotion, CCQ-activity, and CCQ were significantly better in the intervention group, and
CCQ-symptom was significantly better in the intervention group at the 6- and 12-month points (Table 9).

**Psychological status**

The interaction effect between time and group (control or intervention) for psychological status on the Hospital Anxiety and Depression Scale (HADS) showed that the intervention group improved significantly compared to the control group in depression and anxiety, \(p < 0.001\) and \(p < 0.001\), respectively). At all measurement points, depression and anxiety were significantly reduced in the intervention group (Table 9).
Table 7. The effects of self-management of the health coaching self-management programme

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group</th>
<th>Baseline</th>
<th>Six weeks</th>
<th>Six months</th>
<th>Twelve months</th>
<th>F time*group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom management</td>
<td>Intervention (n = 45)</td>
<td>23.82 ± 4.08</td>
<td>29.22 ± 4.95</td>
<td>30.15 ± 4.25</td>
<td>31.91 ± 4.17</td>
<td>50.868</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>24.50 ± 5.09</td>
<td>25.95 ± 4.34</td>
<td>24.05 ± 4.54</td>
<td>22.17 ± 4.62</td>
<td>-0.680</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>-0.616</td>
<td>3.220**</td>
<td>6.404***</td>
<td>10.213***</td>
<td>-0.680</td>
<td></td>
</tr>
<tr>
<td>Daily life management</td>
<td>Intervention (n = 45)</td>
<td>43.95 ± 6.84</td>
<td>51.95 ± 7.01</td>
<td>53.93 ± 7.45</td>
<td>54.49 ± 7.96</td>
<td>52.608</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>44.97 ± 8.39</td>
<td>45.17 ± 8.07</td>
<td>42.82 ± 8.58</td>
<td>40.62 ± 8.09</td>
<td>-0.616</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>-1.189</td>
<td>4.146***</td>
<td>6.388***</td>
<td>7.952***</td>
<td>-0.616</td>
<td></td>
</tr>
<tr>
<td>Emotion management</td>
<td>Intervention (n = 45)</td>
<td>34.69 ± 6.78</td>
<td>44.07 ± 6.97</td>
<td>46.18 ± 7.27</td>
<td>48.51 ± 6.83</td>
<td>65.110</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>36.52 ± 7.45</td>
<td>36.70 ± 8.10</td>
<td>34.45 ± 8.84</td>
<td>32.67 ± 8.72</td>
<td>-1.189</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>-0.572</td>
<td>4.774***</td>
<td>6.516***</td>
<td>10.651***</td>
<td>-0.572</td>
<td></td>
</tr>
<tr>
<td>Information management</td>
<td>Intervention (n = 45)</td>
<td>15.80 ± 4.87</td>
<td>20.98 ± 5.16</td>
<td>22.18 ± 5.45</td>
<td>24.71 ± 5.55</td>
<td>62.390</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>16.42 ± 5.19</td>
<td>15.52 ± 5.36</td>
<td>14.70 ± 5.08</td>
<td>13.22 ± 4.20</td>
<td>-0.572</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>-1.249</td>
<td>5.280***</td>
<td>6.345***</td>
<td>9.757***</td>
<td>-1.249</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Intervention (n = 45)</td>
<td>27.87 ± 5.39</td>
<td>35.31 ± 5.53</td>
<td>35.80 ± 5.67</td>
<td>37.38 ± 5.42</td>
<td>76.115</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>29.30 ± 5.15</td>
<td>28.52 ± 6.32</td>
<td>26.97 ± 7.13</td>
<td>24.75 ± 6.51</td>
<td>-1.249</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>-1.356</td>
<td>6.108***</td>
<td>8.489***</td>
<td>12.270***</td>
<td>-1.356</td>
<td></td>
</tr>
<tr>
<td>Self-management</td>
<td>Intervention (n = 45)</td>
<td>146.13 ± 18.27</td>
<td>181.53 ± 22.31</td>
<td>189.13 ± 23.53</td>
<td>197.58 ± 24.23</td>
<td>125.640</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>151.72 ± 19.75</td>
<td>151.87 ± 22.39</td>
<td>142.45 ± 27.17</td>
<td>133.45 ± 23.84</td>
<td>-1.356</td>
<td></td>
</tr>
</tbody>
</table>

**p < 0.01, ***p < 0.001**
Table 8. The effects of physical activity and lung function of the health coaching self-management programme

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group</th>
<th>Baseline</th>
<th>Six weeks</th>
<th>Six months</th>
<th>Twelve months</th>
<th>F time*group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grip</td>
<td>Intervention (n = 45)</td>
<td>24.86 ± 9.61</td>
<td>27.38 ± 10.13</td>
<td>27.93 ± 8.90</td>
<td>28.47 ± 8.76</td>
<td>11.950</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>22.59 ± 9.37</td>
<td>22.43 ± 8.79</td>
<td>22.42 ± 8.83</td>
<td>22.02 ± 8.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>1.098</td>
<td>2.392*</td>
<td>2.861**</td>
<td>3.420**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 minute STS</td>
<td>Intervention (n = 39)</td>
<td>17.04 ± 5.24</td>
<td>18.00 ± 8.65</td>
<td>20.05 ± 7.42</td>
<td>20.76 ± 6.77</td>
<td>5.395</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>Control (n = 25)</td>
<td>16.25 ± 10.05</td>
<td>16.65 ± 9.49</td>
<td>15.12 ± 9.45</td>
<td>15.33 ± 10.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>0.452</td>
<td>0.574</td>
<td>2.330**</td>
<td>2.479**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPAQ</td>
<td>Intervention (n = 45)</td>
<td>66.20 ± 27.51</td>
<td>72.40 ± 29.11</td>
<td>75.10 ± 38.05</td>
<td>87.49 ± 46.01</td>
<td>7.976</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>73.28 ± 56.48</td>
<td>67.16 ± 24.17</td>
<td>65.66 ± 28.06</td>
<td>59.40 ± 25.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−0.748</td>
<td>0.895</td>
<td>1.288</td>
<td>3.415**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung function</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV1%</td>
<td>Intervention (n = 45)</td>
<td>39.38 ± 18.26</td>
<td>44.38 ± 20.83</td>
<td>42.09 ± 21.47</td>
<td>42.40 ± 21.01</td>
<td>5.660</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>39.81 ± 16.94</td>
<td>40.92 ± 20.42</td>
<td>36.52 ± 15.91</td>
<td>34.65 ± 16.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−0.114</td>
<td>0.771</td>
<td>1.345</td>
<td>1.894</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FVC%</td>
<td>Intervention (n = 45)</td>
<td>56.88 ± 19.03</td>
<td>58.76 ± 17.56</td>
<td>57.99 ± 18.29</td>
<td>59.15 ± 18.08</td>
<td>6.540</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>53.60 ± 15.58</td>
<td>53.97 ± 17.73</td>
<td>50.01 ± 15.98</td>
<td>46.95 ± 15.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>0.863</td>
<td>1.250</td>
<td>2.129*</td>
<td>3.357**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01
Table 9. The effects of quality of life and psychological status of the health coaching self-management programme

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group</th>
<th>Baseline</th>
<th>Six weeks</th>
<th>Six months</th>
<th>Twelve months</th>
<th>F time*group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCQ-symptom</td>
<td>Intervention (n = 45)</td>
<td>2.66 ± 1.27</td>
<td>2.03 ± 0.97</td>
<td>1.83 ± 0.89</td>
<td>1.84 ± 1.25</td>
<td>23.272</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>2.68 ± 1.47</td>
<td>2.29 ± 1.22</td>
<td>2.63 ± 1.24</td>
<td>3.21 ± 1.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−0.068</td>
<td>−1.095</td>
<td>−3.427**</td>
<td>−4.782***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCQ-emotion</td>
<td>Intervention (n = 45)</td>
<td>1.62 ± 1.37</td>
<td>1.45 ± 1.30</td>
<td>1.14 ± 1.06</td>
<td>0.88 ± 0.86</td>
<td>24.217</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>2.00 ± 1.39</td>
<td>2.21 ± 1.26</td>
<td>2.66 ± 1.51</td>
<td>3.25 ± 1.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−1.260</td>
<td>−2.708**</td>
<td>−5.418***</td>
<td>−8.946***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCQ-activity</td>
<td>Intervention (n = 45)</td>
<td>2.10 ± 1.28</td>
<td>1.39 ± 1.27</td>
<td>1.29 ± 1.23</td>
<td>1.25 ± 1.20</td>
<td>25.036</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>2.68 ± 1.47</td>
<td>2.63 ± 1.60</td>
<td>3.00 ± 1.77</td>
<td>3.45 ± 1.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−1.928</td>
<td>−3.972**</td>
<td>−5.215***</td>
<td>−7.004***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCQ</td>
<td>Intervention (n = 45)</td>
<td>2.31 ± 1.03</td>
<td>1.65 ± 0.89</td>
<td>1.47 ± 0.83</td>
<td>1.41 ± 0.93</td>
<td>27.751</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>2.57 ± 1.23</td>
<td>2.41 ± 1.18</td>
<td>2.77 ± 1.30</td>
<td>3.31 ± 1.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−1.399</td>
<td>−3.388**</td>
<td>−5.531***</td>
<td>−7.843***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Psychological status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group</th>
<th>Baseline</th>
<th>Six weeks</th>
<th>Six months</th>
<th>Twelve months</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>Intervention (n = 45)</td>
<td>7.64 ± 3.18</td>
<td>7.18 ± 2.74</td>
<td>6.42 ± 2.69</td>
<td>5.95 ± 2.47</td>
<td>−0.870</td>
<td>20.864</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>8.27 ± 3.49</td>
<td>8.92 ± 3.98</td>
<td>9.72 ± 4.14</td>
<td>10.87 ± 4.32</td>
<td>−2.377*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−4.403***</td>
<td>−6.534**</td>
<td></td>
<td></td>
<td>−6.007**</td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>Intervention (n = 45)</td>
<td>3.55 ± 4.14</td>
<td>3.13 ± 3.77</td>
<td>2.38 ± 3.39</td>
<td>2.13 ± 2.90</td>
<td>13.033</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Control (n = 40)</td>
<td>4.42 ± 3.99</td>
<td>5.82 ± 4.67</td>
<td>6.05 ± 4.24</td>
<td>7.12 ± 4.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>−0.982</td>
<td>−2.936**</td>
<td>−4.432**</td>
<td>−6.007**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05, **p < 0.01, ***p < 0.001
Experiences of a health coaching self-management programme from the patients’ perspective

Four categories and 13 subcategories emerged describing the patients’ experiences of the programme. Categories, subcategories, and examples of significant quotations are shown in Table 10.

**Gaining insight**

The category ‘Gaining insight’ describes how the intervention helped patients become more aware of risk factor prevention, rehabilitation, and medical treatment, as well as individual responsibilities, because they did not have a comprehensive perception of COPD before attending the programme.

**Taking action**

The category ‘Taking action’ describes the fact that the intervention increased the motivation for a healthier lifestyle, such as engaging in different physical activities and keeping regular eating habits. Patients also described that they began to actively seek more information regarding the disease from different resources and to coach other patients with COPD in managing the disease.

**Feeling supported**

The category ‘Feeling supported’ describes patients’ experiences of support from the programme, such as telephone coaching, pedometer use, and information booklets. The programme also facilitated their families’ understanding of the disease and how they could support the patient.

**Being hindered**

The category ‘Being hindered’ describes the patients’ experiences of certain barriers which influenced them in following the programme, such as their individual factors, surroundings, and family context. They also described some shortcomings of the programme where it did not fulfil all their needs and gave suggestions on how to improve it.
Table 10. Quotations, subcategories, and categories describing the experiences of patients with COPD when attending the self-management programme

<table>
<thead>
<tr>
<th>Quotations</th>
<th>Subcategories</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>'I have read the booklet on COPD. I understand that the disease has a relationship to air pollution and haze. I have also been told that it is impossible to completely recover because COPD is a chronic disease.' (Participant 3)</td>
<td>Awareness of causes and prognosis</td>
<td>Gaining insight</td>
</tr>
<tr>
<td>'I think the coach gave me a lot of good suggestions about disease recovery and treatment, which let me understand how to prevent it, how to treat it, how to maintain my health. This is my feeling.' (Participant 11)</td>
<td>Awareness of COPD management</td>
<td></td>
</tr>
<tr>
<td>'With the coaching, I know that I should control my disease by myself. I should do breathing exercises, take medicine regularly by myself. I should control my diet, and irritable food cannot be eaten, and I should remember to rest.' (Participant 20)</td>
<td>Awareness of personal responsibility</td>
<td></td>
</tr>
<tr>
<td>'I always read the newspaper now. When some health-related information is described in the newspaper, I always cut it out and keep it. I just read it before, but now I pay more attention to it and keep it.' (Participant 15)</td>
<td>Seeking information</td>
<td>Taking action</td>
</tr>
<tr>
<td>'I ate a lot in the past. Eating without restraint, following my inclinations, drinking and smoking. But now I don’t do that. I only eat three times every day, and not more even when I’m very hungry. My life habits have changed a lot and I feel comfortable when changing them.' (Participant 1)</td>
<td>Remaining healthy</td>
<td></td>
</tr>
<tr>
<td>'I did abdominal breathing when I felt uncomfortable breathing when climbing the mountain. The breathing then became calm and normal.' (Participant 4)</td>
<td>Enabling activities</td>
<td></td>
</tr>
<tr>
<td>'One of my comrades-in-arms, he was better than before after I coached him about how to do respiratory training and keep a positive attitude.' (Participant 1)</td>
<td>Coaching other people</td>
<td></td>
</tr>
<tr>
<td>Quotations</td>
<td>Subcategories</td>
<td>Categories</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>‘My coach always contacted me and encouraged me, whether it was to exercise, practise respiratory exercises, or take medicine regularly ... reminded me to increase or decrease what I’m wearing and not go outside if the weather is bad.’ (Participant 7)</td>
<td>Being reminded and encouraged</td>
<td>Feeling supported</td>
</tr>
<tr>
<td>‘Telephone coaching. Timely contact. I can ask my coach when I cannot understand. These aspects will give me a lot of benefits. It is really very good ... for example, how to take medicine, how to do rehabilitation, I can consult with you.’ (Participant 14)</td>
<td>Facilitative access</td>
<td></td>
</tr>
<tr>
<td>‘My family has learned a lot after my coach coached me. My daughter didn’t know that COPD was so serious. But after you coached me, she learned how to prevent it.’ (Participant 18)</td>
<td>Enlightened family</td>
<td></td>
</tr>
<tr>
<td>‘I read the booklet sometimes, but I can only understand the pictures because I cannot read the words. I can only understand the picture of the breathing exercise; the others I did not understand.’ (Participant 18)</td>
<td>Limitations in individual prerequisites</td>
<td></td>
</tr>
<tr>
<td>‘Sometimes I cannot continue to take medicine; one reason is my medical insurance. I have no money to buy the drug.’ (Participant 14)</td>
<td>Limitations in surroundings</td>
<td></td>
</tr>
<tr>
<td>‘I recorded the diary at the beginning after discharge. However, I only kept the diary for one month, and then I didn't want to do it. It was a little tedious.’ (Participant 12)</td>
<td>Limitations in programme contents</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

Methodological considerations

There are both quantitative and qualitative approaches in this thesis. Validity and trustworthiness should be ensured in all studies.

Validity in Quantitative methods (I-III)

External validity

External validity refers to whether the findings can be transferred to other groups and settings, often referred to as generalizability or applicability (Kazdin, 2002). Within Study I, there were three general hospitals and one specialized hospital included to improve generalizability. Studies II and III were also extended to two hospitals and the severity of disease to GOLD II–IV. A threat to generalizability was that GOLD I was not included because few patients with GOLD I were admitted to the hospital. Furthermore, because of the follow-up, most of the patients were living in urban areas, which contributed to bias as the patients who lived in rural areas were absent. Patients were from one city in northern China in this study. Therefore, generalizing our findings to all patients with COPD in China is difficult. Health coaching is a new concept in China, and there is no regular follow-up and fewer self-management strategies provided for patients with COPD, which contributed to more facilitators that patients acquired when the health coaching programme was implemented in this study. The danger is that the contents of the programme may not be generalizable to other countries or cultures which have already implemented health coaching for patients with chronic diseases for a long time.

To enhance external validity, a sufficient sample size is a general recommendation (Polit & Beck, 2016), and a target sample size was calculated for the quantitative studies (I–III). In Study I, 5–10 patients for each variable were recruited in accordance with the principle of sample size in multi-factor analysis (Jin & Cao, 2003). In Studies II and III, power analysis was calculated for the RCT, which could be considered as
strengthening the results. Moreover, a reliable follow-up period of 12 months strengthened the stability and generalizability of the findings to other samples and settings (Polit & Beck, 2012).

**Internal validity**

Internal validity refers to issues related to construction of a study (Kazdin, 2002). For Studies I–III, all of the questionnaires had good reliability and validity, which could be considered as strengthening the construct validity. However, one factor threatening internal validity could be that the questionnaires were handed out by a research assistant who guided the patients in completing them because most of the patients were too old to complete them by themselves. To minimize information bias, researchers trained the research assistants to be qualified data collectors who could instruct the patients to complete the questionnaires properly.

To evaluate the effects of the intervention, a RCT design was performed, which is considered as the gold standard to reduce selection bias. Randomization is necessary to balance unknown and unmeasured factors since only a part of the outcome can be explained by known factors (age, gender, comorbidity, and so on). One threat was that this study did not follow the principle of a blind experiment because it was impossible to blind the patients in a complex intervention due to the need for the informed consent of the patients. Another factor affecting validity was that a large amount of missing data for the 1-minute STS in the control group (49%) reduced the internal validity because some patients were afraid of breathlessness or felt uncomfortable at that time. Serving to strengthen internal validity, other variables which evaluated the effects of intervention had low drop-out rates.

**Reliability**

Reliability concerns the level of agreement between different assessment of the same outcomes as made by the same rater at different times or by different raters (Polit & Beck, 2016). All of the results were transferred to SPSS, and two persons input the results into SPSS to ensure that the data were correct, which could be considered as a strength of the study. To enhance reliability and to reduce Type 1 and Type 2 errors, the level of significance was set at 0.05 and samples were sufficiently large. One factor acting to reduce reliability could be that the study designer and data analyst were the same person, who might have an ambition to focus on positive results. To strengthen
reliability, the data set was shared among the research team and processed by two persons to check the results.

**Trustworthiness in Qualitative methods (IV)**

**Credibility**

Credibility deals with confidence in how well the data addresses the intended focus (Lincoln & Guba, 1985). Prior to the first interview, pilot interviews were conducted to test the interview outlines. One question on the influence on family or friends was added to the interview guide, and the pilot interviews were considered appropriate for inclusion in the analysis. Furthermore, the authors had different experiences working with patients with COPD and using qualitative methods. To strengthen credibility, scientific and rigorous processing of the data was performed by all of the authors according to the methods used. Meaning units and coding of transcripts were carried out both independently and jointly among the authors to ensure comparisons of differences and similarities until agreement was reached (Lincoln & Guba, 1985). These discussions contributed to valuable perspectives in the data analysis and strengthened the credibility.

**Dependability**

Dependability refers to replicability and consistency in qualitative research (Lincoln & Guba, 1985). For this, it is essential that the descriptions of the inclusion criterion are clarified as well as the processes concerning how the study was conducted (Shenton, 2004). To identify and select a variety of information-rich cases who had participated in the intervention, a purposeful sampling was carried out among the patients who agreed to participate in Study IV. The sampling strategy aimed to achieve the inclusion of patients of different age groups, both genders, different work backgrounds, and a variety of severities. The dependability of the study was enhanced by using a semi-structured interview guide which directed the interview. The interviewees received the same instructions, opening question, and interview outlines to reduce the risk of a change in interview technique. However, interviewing is an expanding process (Polit & Beck, 2016). The interviewer’s experience of the research aim might be different in each interview (Creswell & Poth, 2017). This can be considered a threat to dependability since it could influence the interviewer to ask a variety of follow-up questions in different interviews.
To increase dependability, the interviewers were both respiratory nurses with similar work histories, and both of them had experience in conducting interviews, as both were trained by the first author. The first author was familiar with the context of transcription and continuous discussions were held among all the authors during the analysis process to reach consensus so as to strengthen dependability.

**Confirmability**

Confirmability refers to objectivity and the grounding of the findings in the data (Lincoln & Guba, 1985). To strengthen confirmability, the interviews were recorded and transcribed verbatim to avoid distorting the data. All of the research team members followed up the steps of inductive content analysis in open coding, creating categories, and abstraction (Elo & Kyngas, 2008). The emerging codes, subcategories, and categories were critically discussed and compared within the research group until agreement was reached. Because all of the interviews were conducted in Chinese, the first three interviews were translated into English to allow a thorough discussion among the authors about the emerging meaning units. Afterward, only the meaning units were translated from the other 17 interviews. To enhance confirmability, the first interview translations were checked by a teacher who was skilled in both Chinese and English. In addition, all the authors have extensive experience as a nurse, two are familiar with the research field, and the other two have extensive experience using qualitative research methods. Similarly, the first author was responsible for writing the manuscripts and the others read the texts and discussed them together to ensure proximity to the findings. Moreover, quotations were presented in the finding section to confirm the relevance of the perceptions (Lincoln & Guba, 1985).

**Transferability**

Transferability refers to the extent to which the findings can be transferred to other groups and settings (Lincoln & Guba, 1985). To strengthen transferability, the participants, setting, sampling process, data collection, and data analysis were thoroughly described in the thesis (Polit & Beck, 2016). Variation among the patients can promote the possibility of achieving more varieties of experience, which is known to be a better method to enhance trustworthiness in qualitative research (Creswell & Poth, 2017; Polit
& Beck, 2016). Purposive sampling was used to ensure the representativeness of patients according to their sociodemographic and clinical characteristics in Study IV. Factors working against transferability were that the severities of the patients were on the GOLD II–IV (moderate, severe, and very severe) levels, and that the patients were only recruited from two hospitals in one northern city of China.

**Discussion of the results**

This thesis demonstrated that high physical activity, high salary, and low age are associated with higher self-management skills of patients with COPD. According to the results of Study I and a review of other relevant studies, a health coaching self-management programme was designed and shown to be an effective intervention strategy for patients with COPD in China. The programme improved the self-management skills, physical activity, and lung function of patients with COPD, as well as quality of life and psychological status. The patients in the intervention group expressed being more aware of the importance of knowledge of the disease and their own responsibilities. The programme increased their motivation to engage in different physical activities and gain more support from various resources. However, the patients were also hindered by individual, surroundings, and family barriers, as well as programme shortcomings.

**Self-management**

In Study I, 57% of patients with COPD were at a low and moderate self-management level, and the lowest of these was information management, referring to communication between patients with COPD and nurses or accessing multiform media to gain information about COPD. Although smoking is the most significant risk factor for COPD, 45% of male patients with GOLD III-IV (severe and very severe stage of COPD) are still current smokers in China (Wang et al., 2018). The reason for this could be that the people in China are being targeted by the tobacco industry and the fact that nearly half of the male physicians in China are current smokers (Cheng, 2015). This indicates that the motivation for smoking cessation in patients with COPD could be affected leading to low self-management skills.

Understanding one’s illness can be viewed as a cognitive prerequisite for knowing how to cope with symptoms in everyday life and change behaviors
to a healthier lifestyle (Bonsaksen et al., 2012). However, low knowledge of COPD has been shown to negatively affect COPD education programmes (Ivziku et al., 2018; Nakken et al., 2017; Scott et al., 2011; Wong & Yu, 2016). The intervention in Studies II and III showed that the programme improved the acquisition of knowledge and patients’ skills in dealing with the symptoms, which is consistent with other nurse-led self-management findings (Billington et al., 2015; Bucknall et al., 2012; Jolly et al., 2018). In the self-management of chronic disease, sufficient resources are essential to provide necessary knowledge, confidence, and problem-solving skills. It has also been demonstrated that self-efficacy is a crucial mediator between knowledge and self-care (Wu et al., 2016), and between self-care and self-management (Richard & Shea, 2011). Community continuing care by respiratory nurse specialists who have previously been already familiar with the patients condition has been shown to increase self-efficacy for patients with COPD in China (Li PD et al., 2015). This study also indicated that the health coaching self-management programme improved self-efficacy after discharge. Firstly, the nurse-coach contacted the patient and together they made a personal health plan before discharge. Secondly, monthly telephone coaching affirmed the implementation of the self-management intervention, encouraged the health-related behavioral changes and discovered the problems timely, as well as provided appropriate solutions and instructions which strengthened the patients’ confidence (Bandura, 1977a).

Patients with COPD have described insufficient support from their healthcare providers because too little time is allocated in the outpatient clinic, which leads to a lack of access to resources to help them cope with day-to-day problems (Wodskou et al., 2014). However, the patients in Study IV stated that telephone coaching provided access to timely and appropriate care, communication, and coordination between themselves and the nurse. Telephone support for long-term conditions has been shown to provide potential benefits for self-efficacy, health behavior, and health status (especially for those having difficulties assessing health services) because it can gradually improve patients’ skills and tailor support to the patient’s needs (Dennis et al., 2013; Walters et al., 2012). In a review aiming to examine the effectiveness of telephone-based coaching services for the management of patients with chronic diseases, planned weekly or monthly telephone coaching and unscripted telephone coaching were the most effective interventions (Dennis et al., 2013). While the unscripted coaching allowed the coach to tailor support to the patient's individual needs, the planned coaching services
had the advantage of regular contact and helping people develop their skills over time in order to safeguard continuous interaction and strengthen the relationship between patients and coach (Ekman et al., 2011). Although COPD was one of the diagnosis in the inclusion criteria of this review, none of the 30 papers included patients with COPD (Dennis et al., 2013).

Although patients gained more awareness and responsibilities in managing the disease, accomplishing changes in self-management and lifestyle were not feasible for everyone as described in Study IV. Patients individual limitations such as difficulties in reading the booklet and keeping records in the diary due to low literacy, which is consistent with another study stating that individual differences may have impacted on the patients’ abilities to self-manage (Baker & Fatoye, 2017). Patients with COPD have been shown to have low health literacies, which contributes to an inability to obtain, process, and understand health information (Kale et al., 2015; Roberts et al., 2008), and difficulties in defining personalized goals (Hillebregt et al., 2017). Health literacy is a skill that determines individuals’ abilities to acquire, understand, and utilize health-related information that maintains and promotes the health (WHO, 2015). Low health literacy is associated with poor disease-related knowledge in respiratory disease (Mackey et al., 2016). In a large community-based epidemiological study in China, only 18.2% of patients with COPD were aware of the effects of quitting smoking, 27.1% exercised regularly, 34.8% ate a high-quality diet, and only 8.4% followed all of the three healthy behaviors (Yan et al., 2017), because most of the patients were asymptomatic and unaware of their illness (Zhong et al., 2007). In future studies, nurses should pay more attention to the patients with COPD with low health literacy who should be inspired to share health decision by their narrative (Ekman et al., 2011) in order to develop more realistic and applicable health coaching programmes.

**Physical activity**

Physical activity was associated with self-management of patients with COPD (Study I), and the health coaching self-management programme improved the physical activity of patients (Study II). This result is consistent with a study which also delivered telephone health coaching by a nurse to increase physical activity for patients with COPD at the 6-month follow-up, but no difference was found at 12 months (Jolly et al., 2018). Another pedometer and web-based intervention showed that improvement of physical
activity can be problematic to maintain due to the intervention duration and temperature variations (Wan, 2017).

The pedometer, as a main tool in our study, was a useful device for patients to monitor and record their daily physical activity by themselves, and it has been reported to be a good facilitator to promote physical activity for patients with type 2 diabetes (Baskerville et al., 2017). Patients with COPD suffer from respiratory and muscle dysfunction, which leads to fatigue and a reduction of physical activity (Kovarik et al., 2017). The aim of using a pedometer in our study was not only to monitor the physical activities of the patients, but also to ensure the awareness of their own appropriate intensity and capacity of physical activity by recording the step counts and duration in the self-management diary according to personal health conditions and environmental variation, which can facilitate patients to set their goals to perform accountabilities in health behaviors (Wolever et al., 2013). This indicates that the pedometer as a promoter of resource utilization, which is one core skill in self-management (Lorig & Holman, 2003), could promote and sustain physical activity for patients with COPD in the long term through feasible application.

The fact that all physical measures were significantly better in the intervention group at twelve-month means that the health coaching programme improved the physical activity for a long time. Patients’ thoughts and consciousness on the decision to develop accountability in physical activity goals were the first step of our intervention, which probably contributed to the maintenance of success with the health coaching programme. Priority to patients’ favoured activities, with insights to aspects such as income and ethnicity, is important when designing health interventions by nurses and other health practitioners (Szanton et al., 2015). When the nurse-coach applies the techniques of motivational interviewing (Soudan, 2014) and encourages patients to express their hopes and goals, it helps the nurse-coach if specific instructions for the improvement of physical activity are provided. Patients chose their favourite exercise, set the goals for their physical activity, and maintained individual goals by themselves. This is important since respected and encouraged patients are the best experts to make health decisions about their own life through the process of health coaching (Lorig & Holman, 2003). This was also considered as successful points in the increased self-efficacy toward physical activity and maintained long term health-related behaviors in the intervention of this thesis.
**Lung function**

The effects of the programme showed that only FVC% in lung function was improved within 12 months. FEV\(_1\)% remained at the same level, but was significantly better than in patients within the control group over time. The results is consistent with other nurse-led home-based exercise programmes with ergo-bicycle (Wakabayashi et al., 2018) and inspiratory muscle training (Bavarsad et al., 2015). FEV\(_1\)% is a poor descriptor to assess the severity of breathlessness, exercise limitation and health status when evaluating the effects of intervention for patients with COPD (GOLD, 2018). A lot of nurse-led interventions use this parameter because it is an assessment tool to classify the airflow limitation severity. Some systematic reviews indicate that drug therapy and exercise training are crucial parts of the intervention programme to improve FEV\(_1\)% (Ni H et al., 2017; Liao et al., 2015). In Studies II and III, even respiratory muscle exercise, physical activity promotion and medication management were main contents in the health coaching programme, FEV\(_1\)% was also not improved. Nurses are undertaking an important role in the intervention programme, but there are few full-time positions to provide intervention (Vincent & Sewell, 2014), which leads to most nurses lacking formal training in exercise physiology (Garvey et al., 2013). Regular received training is an important approach to strengthen skills and more professional knowledge for respiratory nurse specialists who engage in health coaching for patients with COPD. Furthermore, nurse-coach, who has to effectively serve in both roles with clinical nurses of extensive professional knowledge and health coach of mastery skills in motivational interview (Wolever et al., 2013), also played an essential role in the whole process of health coaching. In future studies, training the nurses to be successful health coaches provided for patients with different disease should be more explored.

**Quality of life**

The effects of the present intervention improved the quality of life of patients with COPD. The result is consistent with systematic reviews in the improvement of quality of life of patients with COPD (Cannon et al., 2016; Jolly et al., 2016; Zwerink et al., 2014). Quality of life has been a main and necessary outcome to evaluate the functional status change for trials of COPD self-management. From the perspectives of patients’ with COPD, physical health with fatigue and physical functioning, social health with instrumental support, ability to participate in social roles and activities,
companionship and emotional support, as well as coping with COPD are the most important domains in quality of life (Paap et al., 2014). In Studies II and III, the contents of the programme related to physical function promotion, various resources support and how to cope with exacerbation were applied to create effective and supportive care to increase quality of life.

However, other studies with health coaching have different results on quality of life of patients with heart disease and diabetes (Karhula et al., 2015; Tiede et al., 2017) due to low skills in using telemonitoring device and variation of call duration according to tailored individual needs. The most important successor of our programme was probably the convenient operational pedometer which makes the programme more realistic and avoiding failure, and regular telephone coaching in order to motivate patients to report the variation of the disease accurately and make informed choices when delivered various treatments and solutions, which have shown to promote the partnership between patients and coach (Lorig & Holman, 2003).

**Psychological status**

In Studies II and III, the health coaching self-management programme was found to reduce the anxiety and depression in both the short and long terms, which is inconsistent with another study of nurse-led self-management programmes for patients with mild to moderate COPD (Jonsdottir et al., 2015). A reason for this difference might be the fact that some patients with COPD consider the disease as ‘self-inflicted’ and unworthy of assistance due to individuals’ bad behaviors leading to the disease which contributes to emotional difficulties (Ellison et al., 2012).

Anxiety and depression are important comorbidities in COPD (GOLD, 2018). Some studies report that 55% of patients with COPD suffer from anxiety disorder (Panagioti et al., 2014; Willgoss & Yohannes, 2013), which contributes to a negative effect in quality of life and functional limitations (Eisner et al., 2010; Felker et al., 2010). Implementation of personalized strategies has been recommended to reduce anxiety and depression in patients with COPD due to variation of patients’ belief about disease and disunity screening and treatment criteria (Tselebis et al., 2016).

In Studies II and III, the improvement of self-efficacy and physical activity might be the mediators which reduced anxiety and depression, and most of the
participants suffered from a moderate to very severe disease whose mood were not so low at baseline. The experience of participants in the study IV also indicated that regular contact with a nurse-coach increased their confidence in coping with dyspnoea and in improving self-management skills (Bandura, 1977a). Improvement of self-efficacy is a predictor of decreasing psychosocial impact and increasing physical activity for patients with COPD (Bentsen et al., 2010; Simpson & Jones, 2013). Nurse-coaches, who are the most commonly health coaches in the world (Olsen, 2014), have been proved to have an important role in supporting the self-management of patients with COPD in order to increase the patient activation and confidence (Early et al., 2017), and nurses comprise the majority of professionals who deliver coaching (Wolever et al., 2013). In China, community care nurses have insufficient knowledge of COPD (Xu et al. 2016), and respiratory nurse specialists are too busy to deliver self-management coaching and follow-up for patients with COPD. In Studies II and III, the intervention was delivered by a registered nurse who had a background in clinical and teaching practice in COPD which probably promoted the efficacy. Educated nurse-coaches with enough knowledge and interpersonal skills to support and encourage patients’ decisions to change their behavior and manage their symptoms (Wolever et al., 2013), as well as doing their best to guide patients to seek utilized resources for better management of COPD through telephone coaching, is an important facilitator to strengthen patients’ confidence in controlling their disease by themselves.

Many health coaching interventions have proved to be effective in the short-term among patients with chronic conditions (Kivelä et al., 2014), however, a research gap exists regarding its long-term effectiveness (Dejonghe et al., 2017). In China, there is a lack of a community-based approach in COPD management. Instead the focus has been on patients with hypertension and diabetes who are provided four follow-up visits per year with free examinations and tests for blood pressure and glucose (Xiao et al., 2014). Our intervention as a motivational strategy for patients had positive effects in both the short term (6 weeks and 6 months) and long term (12 months). The reasons can be analysed from the following aspects. Firstly, chronic disease management approaches are neither patient-centred nor involve self-management of their health conditions in China (Li et al., 2010), because the concept of self-management for COPD is not well-known and self-care activities are less likely to be performed without structured support in China. A new health coaching self-management in our thesis let patients
participate in a service which has never been taken before, and patient’s perceptions and needs in their daily activities were also considered which can sustain partnerships between patients and nurse-coach (Wolever et al., 2013). Furthermore, the trained nurse-coach understood the patients’ motivations to engage in and adhere to health behaviors, and respected their choices, which is of vital importance in the maintaining and improving of their health (Ekman et al., 2011). Secondly, improvement of self-efficacy is necessary to maintain long-term health-related behavior change (Bandura, 1977a; Stellefson et al., 2012), such as taking medicine regularly and performing physical activities every day. Telephone coaching is not only convenient for patients to access valuable knowledge, but also by saving the nurse-coach’s travel time for delivering individual face-to-face visits in patients’ homes and make it a less expensive approach (Billington et al., 2015). Nurses can use their time more efficiently in providing telephone coaching than in other effective interventions (Billington et al., 2015). Thirdly, the fact that the patients allocated into the intervention group received a free pedometer might have been a more intrinsic motivator to engage in physical activity and make better effort to maintain the activity over the study period.
Conclusion

This thesis contributes to knowledge about the crucial contents that should be included in an intervention to improve the self-management and other health outcomes for patients with COPD. A randomized controlled trial comparing a health coaching programme to usual care during 1 year showed that health outcomes as well as physical activity, lung function, self-management, quality of life, and psychological status can be improved, both in the short and long term.

This thesis also provides insight into patients’ perspectives of the intervention. The patients perceived positive interaction with the coach allowing them to acquire greater motivation and engagement to manage COPD and feel more support from a variety of resources. However, some hindrances to the strategy were found for some patients with COPD and should be considered in future studies.
Clinical and research implications

Implications for healthcare practice

- Self-management of patients with COPD is low in China, which merits greater attention by health care organisations and health care professionals.
- Making patients realize the importance of self-management and decision-sharing with health professionals will have positive impacts on patients’ health status and well-being.
- The health coaching self-management programme is convenient to use and can be implemented by systematic routines which can guide nurses in following it step by step.

Implications for further research

- The COPD Self-Management Scale need to be translated and validated in other countries outside China.
- The health coaching self-management programme need to be tested in large multi-center randomized controlled trials in diverse study settings for patients with COPD.
- More attention needs to be paid to the content and structure of the self-management programme for patients with COPD who have low-literacy, are elderly or who have financial or family burdens.
- There is a need for more interventions designed together with patients with COPD in order to strengthen self-management skills.
- A professional smoking cessation strategy should be involved in the health coaching process to promote self-management skills for patients with COPD.
Chinese summary

研究背景

慢性阻塞性肺疾病（Chronic Obstructive Pulmonary Disease, COPD）是一种常见的可以预防和治疗的疾病。其特点是存在气流受限，这种气流受限通常是进行性加重，并伴有气道和肺对有害颗粒和气体产生的慢性炎症反应增强。在发达国家40岁以上人群中COPD的患病率约为10%。在2018年Lancet发表的最新一项大规模多中心流行病学调查结果显示，我国同年龄段COPD发病率已高达14%，如此高患病率需要引起医务界人士、卫生决策者和政策制定者的高度重视。

2017年，自我管理教育作为一种非药物治疗策略已经纳入COPD全球诊治指南中。自我管理是指患者自身采取健康行为和预防策略以促进健康的能力。COPD自我管理能力主要包括合理饮食，戒烟，规律服药，控制症状，监测疾病恶化，控制急性加重，管理不良情绪，保持与医护人员联系，协作工作和角色功能，以及合理利用社区资源。对于COPD自我管理干预的效果已经证明可以减少患者的急性加重次数，降低呼吸困难程度和提高健康相关生活质量。然而，失访率高和患者参与度较低是影响自我管理教育效果的主要因素。

在提高自我管理策略研究中，健康教练技术是在发达国家逐渐兴起的一项对慢性病患者的生理、行为、心理和社会均产生积极效果的新的干预策略。该技术是一种由不同背景的医疗专业人员实施的，以行为改变理论为基础，以患者为中心的实践，促使患者自我设定目标，鼓励自我发现，促进形成健康行为。健康教练技术作为一项新兴技术近几年逐渐引入我国，但并未在COPD患者中开展应用。

研究目的

本研究的主要目的是评价健康教练技术对中国COPD患者自我管理的干预效果。

● COPD患者自我管理现状及其影响因素（研究1）
● 评价健康教练技术项目对COPD患者自我管理能力、体力活动、肺功能、生活质量和心理状态的影响（研究2&3）
描述COPD患者参与“健康教练技术提高自我管理项目”的体验（研究4）

方法

第一部分 COPD 患者自我管理现状及其影响因素分析

1. 研究对象

便利选取 2014 年 9 月至 2015 年 3 月在天津市三所综合性三级甲等医院和一所三级甲等专科医院呼吸内科住院的 154 例 COPD 患者作为研究对象。纳入标准：①所有入选者均符合 2014 年版慢性阻塞性肺疾病全球倡议（GOLD）的诊断标准，吸入短效支气管舒张剂后 FEV₁/FVC<70%；②意识清楚，愿意参与本研究。排除标准：①合并其他严重的心、肝、肾疾病；②其他严重影响生活的进行性疾病。

2. 研究方法

本研究为横断面研究，所有调查对象均在研究人员的辅助下填写调查问卷，主要研究工具包括一般资料调查表和 COPD 自我管理量表。

2.1 一般资料调查表 包括性别、年龄、居住环境、家庭支持、教育水平、职业、收入、经济负担、吸烟现状、体重指数、疾病分级、呼吸困难分级、家庭氧疗、服药依从性及运动情况。

2.2 COPD自我管理量表 该量表由张彩虹编制，共包含5个维度51个条目，每道题目均应用5级评分法，量表总分范围是51～255分。第一维度为症状管理维度，包括8个条目，共40分；第二维度为日常生活管理维度，包括14个条目，共70分；第三维度为情绪管理维度，包括12个条目，共60分；第四维度为信息管理维度，包括8个条目，共40分；第五维度为自我效能维度，包括9个条目，共45分。分数值160分以上为自我管理水平高，分数值在144-160分之间为自我管理水平中等，分数值小于144分为自我管理水平低。该量表的Cronbach’s系行为0.87，内容效度CVI值为0.90。

2.3 统计方法 应用SPSS17.0统计软件包进行统计分析。计数资料采用频数和百分比表示，计量资料采用均数±标准差描述。使用Spearman相关性检验进行单因素分析；将单因素分析有统计学意义的变量作为自变量，以COPD自我管理量表分值为因变量，进行多元线性逐步回归分析。
第二部分 健康教练技术对 COPD 患者自我管理的干预效果研究

1. 研究对象

选取2015年9月至2016年9月在天津市两所三级甲等医院呼吸内科住院的97例COPD患者为研究对象。纳入标准：①所有入选者均符合2015年版GOLD的诊断标准，吸入短效支气管舒张剂后FEV1/FVC<70%；②意识清楚，愿意参与本研究；③年龄超过40岁；④能够通过电话随访且定期复查或可以出院后家访的患者。排除标准：①合并其他严重的心、肝、肾疾病及其他疾病的；②其他严重影响生活的进展性疾病；③因家庭住址较远无法随访患者。

2. 研究方法

将97例研究对象依据随机数字表法随机分为干预组和对照组，对照组执行院外护理常规，在出院前根据医嘱由责任护士给予常规的用药和生活方式指导。干预组执行院外护理常规基础上，在患者出院前1天开始实施6个月健康教练技术，并在出院后1天，出院后6周，6个月，12个月4个时间点收集两组患者的肺功能、日常活动水平、肌力水平、自我管理水平、心理健康状况和生活质量，评价健康教练技术的实施效果。

2.1 健康教练技术

第一步：健康教练应用动机性访谈技术，激发COPD患者主动描述其对疾病预防、治疗、康复等相关知识的了解情况，日常生活状态和主要伴随症状，如何应用周围资源应对症状，以及个人的信念、价值观和健康目标；同时评估患者的病情、自我管理能力、日常活动情况、心理状态、肺功能和肌力情况。

在随访的24小时内，健康教练根据访谈和评估的结果将健康问题和计划记录于为每一位患者准备的自我管理手册中，手册中包含COPD相关知识和健康行为日记，日记每周记录一次，包括呼吸功能锻炼频率，用药情况、吸烟状态，以及每天锻炼的类型和持续时间。

第二步：COPD患者和健康教练共同讨论个体化健康计划，明确双方在项目实施过程中承担的责任，共同讨论并确定戒烟方案、用药方法、呼吸功能锻炼技巧和提高日常活动能力策略。健康教练为每位患者准备一个计步器，帮助患者设定切实可行的运动目标，鼓励其每天坚持佩戴并监测个体活动量，患者与健康教练共同拟定各种健康计划制定的优先顺序，并积极寻找资源解决问题。

第三步：COPD患者出院后，健康教练每月以电话形式定期强化健康计划的落实情况。在电话随访中，患者和健康教练共同评估患者参与项目后自我管理的变化，对完成健康计划的患者给予表扬，建立积极体验，赋
予其希望和动力，同时鼓励患者主动陈述在实施健康计划过程中的问题，及时调整健康计划。

2.2 研究工具 主要包括COPD自我管理量表、肺功能、全球体力活动问卷、1分钟起坐试验、握力、临床COPD问卷和医院焦虑抑郁量表。

2.3 统计方法 应用SPSS22.0统计软件包进行统计分析。应用重复测量方差分析进行比较，分别比较组间、时间点之间是否有统计学差异，并对组间和时间点的交互项进行分析，探索各组间的变化趋势是否有差异，如果交互项有统计学意义，提示各组随时间的变化趋势可能不同，在研究过程中，如出现缺失值或者异常值，将采用统计方法进行填补。

第三部分 COPD患者参与“健康教练技术提高自我管理项目”

体验的质性研究

1.研究对象

采用目的性抽样方法，在参与“健康教练技术提高自我管理项目”的所有患者中抽取20名做为研究对象。纳入标准：完成为期6个月的“健康教练技术提高自我管理项目”。排除标准：①慢阻肺急性加重期。②因身体原因或者时间因素不能参加访谈。

2.研究方法

采用半结构式访谈方法，访谈提纲主要围绕患者参与“健康教练技术提高自我管理项目”的感受、在项目实施过程中自我管理行为的改变和遇到的困难方面，对项目的建议等。分析方法应用内容分析法中的归纳法，整个分析过程包括编码、分类和提取三个阶段。

结果

在154名COPD患者中，43%患者自我管理水平高，27%患者自我管理水平中等，30%患者自我管理水平低。在自我管理的5个维度中，日常生活管理维度得分最高，信息管理维度最低。应用多元线性回归探索COPD自我管理水平的影响因素，日常生活，月收入和年龄3个变量进入回归方程，可解释自我管理21.0%的变异。

应用健康教练技术对慢阻肺患者实施6个月干预方案，干预组的COPD自我管理量表（F时间×分组=125.640，P<0.001）、FEV₁%（F时间×分组=5.660，P=0.003）、FVC%（F时间×分组=6.540，P=0.001）、全球体力活动问
卷（F 时间×分组=7.976，P=0.001）、1 分钟起坐试验（F 时间×分组=5.395，P=0.005）、握力（F 时间×分组=11.950，P<0.001）、临床 COPD 问卷（F 时间×分组=27.751，P<0.001）和焦虑（F 时间×分组=13.033，P<0.001）及抑郁（F 时间×分组=20.864，P<0.001）的短期和长期效果均优于对照组。

患者的主观体验也表明该方案使患者深入了解 COPD 疾病的管理知识和个人责任的重要性，并积极采取行动改变不良生活方式，同时感受到了健康教练和家人对自己的精神和情感支持。但也有患者反映由于文化水平低、医疗保险经费不足导致无法完全按照健康教练指导的方式坚持完成。

结论与临床意义

本研究结果显示，我国COPD患者的自我管理能力较低，实施健康教练技术在提高患者自我管理能力、日常活动、肺功能、生活质量与心理健康状况方面是一项有效的干预策略。同时，患者的主观体验也表达了健康教练技术可以使患者在参与疾病自我管理方面更有积极性。本研究首次将健康教练技术在我国 COPD 患者中开展应用，为医务工作者对 COPD 患者实施健康管理提供新的干预策略，今后仍需设计多中心、大样本的随机对照试验以进一步验证干预效果，从而探索出适合我国 COPD 患者从医院到居家的管理策略。

但是，对于家庭经济与照顾负担较重，文化水平较低的患者在制定干预策略时，如何充分调动患者的主观能动性，提高其自我管理能力需要进一步探讨。
Acknowledgements

Even though only my name is on the front page of this book, this thesis received extensive support from several persons. Therefore, I would like to extend my sincere gratitude and give a big thanks to a few people.

To all the participating patients—without you, it would have been impossible to complete the research. Thank you! It is my sincere hope that this thesis will contribute to the improvement of the health status of patients with COPD through more than just a test.

My main supervisor, Jan Mårtensson—you are sagacious and knowledgeable in so many respects. Thank you for making me think more systematically and creatively over the problems.

Yue Zhao, my co-supervisor—you are a solid rock who always supported me whenever I needed guidance. Annette Nygårdh, my co-supervisor, thank you for your encouragement and patient guidance.

Hong Zheng, Yashu Zheng, Xi Yu, and Lixiu Suo, thank you for your cooperation in our health providers team. I have become a qualified coach under your guidance. I learned a lot about therapy, nursing, and rehabilitation for COPD.

The Research School of Health and Welfare, Jönköping University, for providing an excellent research and study environment. The School of Nursing, Tianjin Medical University, for providing a good work environment. The Respiratory Unit in Tianjin First Centre Hospital and Tianjin Chest Hospital, for unstinting support of my research.

For financial support: The School of Health and Welfare, Jönköping University; The School of Nursing, Tianjin Medical University. Research Plan of the Tianjin Science and Technology Development Strategy (Grant No. 17ZLZXZF00480).
A great thanks to master’s students Yanxia Tao and Xiaoyan Dong for assistance with data collection—without you this thesis wouldn’t have been completed.

A great thanks to my doctoral students and colleagues for creating a most inspiring workplace. And my greatest thanks to my family for their everlasting support and never-ending encouragement.

Jönköping, September 2018
Lan Wang
References


Gott M, Gardiner C, Small N, et al. (2009). Barriers to advance care planning


Vaidya T, de Bisschop C, Beaumont M, et al. (2016). Is the 1-minute sit-to-stand test a good tool for the evaluation of the impact of pulmonary rehabilitation? Determination of the minimal important difference in COPD.


18th WMA General Assembly. (1964). WMA Declaration of Helsinki-Ethical Principle for Medical Research involving Human Subject.


