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Relationships between Self-Talk Characteristics, Social Cognitive Constructs, and Pulmonary Rehabilitation Outcomes

by

Anne-Marie Selzler

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Abstract

Background: Exercise cognitions and beliefs are key associates of exercise behaviour. Self-talk is an intrapersonal communication system that may be a useful technique for studying exercise-related beliefs in pulmonary rehabilitation patients. The purpose of this research was to determine the relationships for self-talk, social-cognition, and clinical indicators in PR. **Method:** The following measures were assessed in 78 PR patients during the first two weeks of PR: the 6-minute walk test, St. George's Respiratory Questionnaire, Exercise Self-talk Questionnaire, Self-talk Function Scale, and Social-Cognitive Questionnaire. **Results:** Moderate correlations were found for self-talk, cognition, and clinical indicator relationships that varied by gender. Self-efficacy, perceived severity, perceived difficulty, and personal physical evaluation self-talk had the strongest relationships to cognitions, and clinical indicators. **Conclusions:** Self-talk is related to social-cognitive constructs, health status, lung function, and functional exercise capacity in PR patients. Gender differences may be due to functional ability differences or gendered socialization experiences.

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Chapter 1: Introduction

Chronic Obstructive Pulmonary Disease

Chronic Obstructive Pulmonary Disease (COPD) is a respiratory disorder that is characterized by progressive, partially reversible airway obstruction, systemic manifestations, and exacerbations that increase in frequency and severity over time (O'Donnell et al., 2007). COPD is predominantly caused by a significant smoking history (O'Donnell et al., 2007). Common symptoms include dyspnea (shortness of breath) during exercise or daily activities, cough, wheezing, sputum production, and frequent respiratory tract infections (O'Donnell et al., 2007). The progression of COPD coincides with a downward spiral. During the preliminary stages of COPD, individuals have few symptoms, and as a result, the disease often goes undiagnosed. Dyspnea, the salient symptom of COPD increases as the disease progresses. As dyspnea increases, individuals' activity levels decrease, leading to deconditioning and reduced quality of life. Reduced quality of life and deconditioning in turn lead to less activity, and greater dyspnea. The downward spiral continues as the disease advances and symptoms worsen to impair individuals' ability to function adequately in their lives (Ries et al., 2007).

Respiratory diseases rank as the 4th leading cause of death in Canada, behind Cardiovascular disease, Cancer, and Stroke ("Life and Breath: Respiratory Disease in Canada," 2007). Apart from lung cancer, COPD is the most common respiratory disease in Canada, affecting approximately 754,700 people in 2005 and accounting for 9,607 deaths in 2004 ("Life and Breath: Respiratory Disease in Canada," 2007). COPD is a substantial concern in other developed countries,

contributing to almost 120,000 deaths in the United States in 2000 (Minino, 2002). The mortality data drastically underestimates the impact of COPD because the disease is often a contributory cause of death to common complications such as pneumonia and congestive heart failure, rather than the underlying cause of death ("Life and Breath: Respiratory Disease in Canada," 2007). Furthermore, the economic burden of COPD is substantial. In 2000, the direct and indirect cost of COPD in Canada was $696 million and $1.02 billion dollars, respectively ("Economic Burden of Illness in Canada," 2000). Direct costs include hospital care, physician visits, drugs and research, and indirect costs include mortality, and long-term disability.

Pulmonary Rehabilitation & Associated Outcomes

As smoking induced lung damage is irreversible, the primary goal of pulmonary rehabilitation (PR) is to assist individuals to achieve the highest level of functioning possible (Ries et al., 2007). In PR, level of function is commonly assessed by health status measures, as well as functional exercise capacity. Both general and disease specific health status measures have been identified as important outcomes of PR (Lacasse, Goldstein, Lasserson, & Martin, 2006). General health status measures assess the general health and well-being of individuals, and disease specific measures assess health status as it pertains to specific characteristics of COPD (i.e., breathlessness). The combination of general and disease-specific measures of health status is recommended as ,together, they are more informative than one measure alone (Moullec, Laurin, Lavoie, & Ninot, 2011). However, if participant burden is a concern, a disease

specific measure of health status may be preferable over a general measure of health status, as it may measure more salient outcomes to PR. Functional exercise capacity is measured by timed walk tests and is also considered to be an important outcome of PR (Lacasse et al., 2006). This measure assesses an individual's physical ability and potential to function independently.

The Medical Research Council Dyspnea Scale (MRC) assesses perceived severity of breathlessness. Shortness of breath while exercising and performing routine activities is the most prominent symptom of COPD. The MRC has been shown to provide important prognostic information on survival of COPD, and was found to be a superior predictor of mortality than lung function (Nishimura, Izumi, Tsukino, & Oga, 2002).

Pulmonary rehabilitation is regarded as critical to manage symptoms associated with COPD and to achieve the highest level of functioning possible, with the primary goal of patients self-managing their disease. In order to achieve this goal, patients in PR are educated about their disease, treatment options, and on the frequency, intensity, time, and type of exercise they should be doing. Importantly, participation in PR has been shown to have substantial health benefits in patients with COPD. In two recent reviews on the impact of PR on the management of COPD, it was found that participation resulted in improved health status, and functional exercise capacity (Lacasse et al., 2006; Ries et al., 2007). Rise et al. also concluded that PR reduces acute exacerbations, hospitalizations, and overall health care costs. In order to maintain health benefits accrued during

PR, continued exercise adherence is necessary. Therefore, it is important that PR programs facilitate the enactment of regular activity in those who attend.

Exercise Adherence in Older Adult Populations

Despite the health benefits associated with sustained physical activity, long term adherence to exercise programs is often poor in adult populations over the age of 50 (Ashworth, Chad, Harrison, Reeder, & Marshall, 2005; Blanchard et al., 2007; Rodgers, Murray, Selzler, & Norman, Under Review; Sniehotta, Gorski, & Araujo-Soares, 2010). In fact, the lack of adherence to physical activity post-program is common in both cardiac (Ashworth et al., 2005; Blanchard et al., 2007; Rodgers et al., Under Review; Sniehotta et al., 2010) and pulmonary rehabilitation programs (Ashworth et al., 2005). To date, it is not known the exact time that physical activity levels tend to drop off after program completion. However, studies indicate that as early as one-month post-rehabilitation, cardiac patients' levels of physical activity have significantly decreased from their physical activity levels during rehabilitation (Rodgers et al., Under Review). The lack of adherence to physical activity post rehabilitation may be due to the structure and composition of the exercise programs. In fact, one study found that found that 68% of older adults in high intensity home-based exercise programs maintained their exercise program two years following compared to 36% of older adults in the centre-based exercise program (King, Haskell, Young, Oka, & Stefanick, 1995). During exercise-based rehabilitation, patients are taught how to execute the prescribed exercise program; however, there is concern that the clinic-based rehabilitation programs may not directly address the social cognitive and

behavioural demands of sustained physical activity in non-clinic based settings (Murray & Rodgers, 2012; Rodgers et al., Under Review). Therefore, it is important to identify the social-cognitive variables most associated with the adoption and maintenance of physical activity in older adult populations, both inside and outside the clinical context, in order to develop effective intervention strategies to foster lasting behaviour change.

Although increased exercise has been found to bring about numerous health benefits, it is often poorly adhered to once the support and services available in PR have been removed. For some people, going to the gym and performing the exercises learned in PR may be feasible, and possibly enjoyable. For others, structured exercise may be unenjoyable, and not feasible because of access or weather constraints. Rather than having the ultimate goal of adherence to specific exercise programs post-PR, having the goal of active lifestyles post-PR may be more applicable. Therefore, it is important for PR programs to help patients integrate physical activity into their lifestyles so that once PR is over, they are able to continue to be active without as much support.

Behaviour Management Programs in COPD

There are not enough resources available to offer continued care and support to all patients with COPD. Researchers and clinicians recognize that patients must be educated and given the tools to effectively manage their own disease. Recently, behaviour management programs have been introduced in people with COPD with the primary aim to reduce hospitalizations (Bourbeau et al., 2003; Fan et al., 2012; Rice et al., 2010). Bourbeau and colleagues as well as

Rice and colleagues found their interventions to be effective at reducing COPD-related hospitalizations. The trial by Fan and colleagues, however, was terminated early due to a marked increase in mortality among the intervention condition compared to the control condition. All three studies implemented education sessions, action planning, and case managers to monitor patients' condition and progress. It could be that the intervention conducted by Fan and colleagues was not as comprehensive as the other interventions leading to an increase in mortality among intervention patients. Fan and colleagues suggested that the adverse effects of their intervention may have been due to patients having a false sense of security for managing their disease. This study indicates that a little bit of knowledge can be a dangerous thing. Behavioural management programs may not be appropriate for all people with COPD, and intensive interventions may be more effective than basic interventions.

The studies testing the effectiveness of behavioural management programs on reducing hospitalization are important to consider when designing interventions in COPD patients. A comprehensive intervention may be better than a basic intervention, and it is important to monitor patient outcomes to ensure harm is not being done. The behavioural management interventions have been focused on identifying symptoms and continuing with the correct course of action. This requires in depth awareness of one's symptoms, and knowledge about the treatment of a complex illness. The behavioural intervention I would potentially propose would be to manage thoughts about exercise. There is likely less risk in my behavioural interventions because the focus is not on awareness of potentially

harmful symptoms, but on exercising regularly; however, it does not mean there is no risk involved. It is important to have a deep understanding of the mechanisms and processes of interventions so that they are maximally effective and safe.

Theory

Health behaviour change research is predominantly influenced by social cognitive models. The theory of planned behaviour (TPB; (Ajzen, 1985), social cognitive theory (SCT; (Bandura, 1977), and the health belief model (HBM; (Rosenstock, 1974) are current models that have accumulated substantial empirical support for their efficacy and effectiveness in understanding human behaviour. These models operate under the premise that behaviour is best understood as a function of people's perceptions of reality, rather than as an objective account of real-world situations (Conner & Norman, 2005), and that behaviour is a result of rational thinking. Likewise, these models also assume that predicting health behaviours is best achieved by testing various aspects of individuals' cognitions. Furthermore, social-cognitive models stipulate the sources of underlying cognitions, which represent the routes to go about changing the cognitions. For example, in SCT, Bandura (1977, 1997) has identified four sources of self-efficacy (SE), which is defined as behaviour specific confidence: verbal persuasion, vicarious experiences, enactive mastery, and affective/physiological interpretations. Self-efficacy is enhanced by bringing about positive changes in one or more of the sources. While it is necessary to identify and understand the variables to target in interventions, such as SE and the

sources of SE, it may be useful to determine specific techniques for bringing about cognitive changes.

According to the social cognitive models mentioned, behaviour is influenced by: (i) a direct influence of cognitive variables on behaviour, (ii) an indirect influence of intentions mediated by cognitive variables, and (iii) by various moderators, such as behaviour type, and population characteristics. In the TPB, intention has a direct influence on behaviour, and also mediates the relationship between attitudes, subjective norm, and perceived behavioural control. Perceived behavioural control has a direct influence on behaviour as well. In SCT, SE influences behaviour directly and indirectly via intention. The relationship among the variables in the HBM including health motivation is much less clear. However, this model maintains that threat perceptions, behavioural evaluation, motivation, and cues to action all to some degree influence behaviour. All three of the theories mentioned are based on belief-based perceptions and have the purpose of understanding and explaining intentional behavior. The relationships among the variables in the TPB and SCT are much more clearly defined than in the HBM, however. Furthermore, TPB and SCT focus more on the purposeful formation of intentions and the enactment of intentions than does the HBM. However, the HBM includes important belief-based constructs that may be particularly useful in understanding behaviour that are not covered in the TPB and SCT.

Due to the underlying similarities in the hypothesized relationships between cognitions and behaviour within the theories, and the fact that no one

theory adequately accounts for 100% of human behaviour, many researchers have begun to advocate for integrating particular constructs from models into the parts of other models (Norman & Conner, 2005a). Norman and Conner also make the point that there is a sizeable overlap between the theoretical constructs in social cognitive models, such as SE (from SCT) and perceived behavioural control (PBC; from TPB). Although some degree of overlap between constructs is expected, problems arise when definitions and labels of constructs are used interchangeably. It becomes difficult to summarize the overall impact that a construct has on behaviour because it is unclear whether studies claiming to measure the same construct are in fact doing so. Measuring similar constructs simultaneously allows for comparison between constructs, and helps to determine which constructs are most influential in particular contexts with particular populations. One study measured PBC, SE, and perceived difficulty simultaneously and found that although these constructs are similar, a conceptual and empirical distinction can be made between these variables (Rodgers, Conner, & Murray, 2008). From their research on these variables, Rodgers and colleagues determined that SE was the superior predictor of health behaviour and intentions. Therefore, measuring related variables simultaneously allows for important theoretical distinctions to be made.

Determining the best constructs to include in the model may depend on the context and the behaviour of interest. In fact, research on the predictive abilities of these models suggests just that. A review on the TPB indicated that behaviour type, age of sample, length of follow-up and type of behavioural measure

moderates the predictive ability of the model (McEachan, Conner, Taylor, & Lawton, 2011). Within SCT, recent studies examining the relationship between SE and exercise maintenance after structured rehabilitation programs have suggested that the context of the exercise is important to consider when determining the influence of social cognitive variables on behaviour (Luszczynska & Sutton, 2006; Murray & Rodgers, 2012). This assertion is supported by the result that the type of SE most associated with exercise, changes from inside to outside the clinical rehabilitation setting. In the HBM, behaviour type has also been shown to impact the outcome of the cognitive variables on behavioural performance (Harrison, Mullen, & Green, 1992; Janz & Becker, 1984). Therefore, it seems beneficial to identify and study the key theoretical constructs most highly associated with each behaviour within the context the behaviour is being performed. For example, the constructs in a model to explain exercise in teens may be very different from the constructs in a model to explain exercise in spinal cord injury patients or patients with COPD attending PR.

Important Perceptions to Consider for COPD Patients

Patients with COPD have a chronic disease that impacts their ability to function optimally, are typically older adults (i.e. over the age of 50 with an average age of 70 years old), have been smoking most of their lives, and have often been sedentary for a number of years (O'Donnell et al., 2007). That is, these people are impaired, the physical performance of their body is declining, and they have been told that they should stop smoking and start exercising, which is often something that they have not done recently, if at all. Due to their chronic illness, it

seems important to include a measure of how their perceptions of their illness influence their exercise behaviour. Since exercise may be new to them it may be important to determine their attitudes towards exercise, and their belief in their ability to execute the physical components associated with exercise, as well as their ability to schedule and cope with the demands of the exercise. Social cognitive theories would predict that the degree to which these cognitions are present will have an impact on the amount of exercise that this population engages in. Further examination of the TPB, SCT, and HBM and their constructs is reviewed below.

Social-cognitive models have been shown to be useful for understanding and explaining health behaviours. However, their ability to predict human behaviour is modest at best. In fact it is likely that they can only account for approximately 15-20% of human behaviour (McEachen et al., 2011). Other factors such as weather, transportation, location, and work have all been identified as barriers to exercise (Keaton et al., 2011). Therefore, while social-cognitive interventions may have an impact on behaviour, there are a number of other factors that could be influencing behaviour that will not be specifically impacted by such interventions.

Theory of Planned Behaviour

The TPB has been examined extensively and has been found to be a useful theory for understanding health behaviours. This theory is a framework for understanding volitional behaviour, where intention is the most important and proximal predictor of health behaviour, which mediates the effect of three belief-

based constructs: perceived behavioural control (PBC), attitudes, and subjective norm (SN; Ajzen, 1985). According to this theory, intention has a direct influence on behaviour, and PBC has both a direct and indirect influence on behaviour. Intentions represent a person's motivation or deliberate plan to execute the target behaviour (Ajzen, 1985). PBC is a judgement of the degree of control over the performance of a behaviour, attitudes are the overall positive or negative evaluation of a target behaviour, and SN are expectations of significant others to engage in a behaviour (Ajzen, 1985).

The TPB has been shown to be an adequate predictor of intention and behaviour, accounting for 27% and 39% of the variance in behaviour and intention, respectively (Armitage & Conner, 2001). A more recent meta-analysis suggests that behaviour type has a significant impact on the effectiveness of the TPB (McEachan et al., 2011). This review found that the TPB was better at predicting diet and physical activity behaviours (23.9% and 21.2% variance accounted for, respectively), than risk detection, abstinence from drugs, and safe sex practices (between 13.8% and 15.3% of variance accounted for). This finding suggests that examining additional predictors of behaviour within this model might be useful, particularly in the case of the latter behaviours. For example, performance of detection, abstinence and safer sex practices may be explained better when threat perception is included into the model. In these behaviours there is a more direct relationship between performing the behaviour and preventing diseases than there is in diet and physical activity behaviours, although threat perception may also be relevant to these latter behaviours.

When examining the individual constructs in the TPB, McEachan et al. also found that the relative importance of each TPB variable to behaviour varies according to the type of behaviour assessed. For physical activity, attitudes and PBC are superior predictors of intention and behaviour than SN. However, SN is a superior predictor of intentions for safer sex and risk behaviours than physical activity, and the correlations between SN and behaviour are strongest for risk behaviours (McEachan et al., 2011). The difference between the predictors of specific behaviours may in part be due to the proximity of the social situation to the performance of the behaviour. Health-risk behaviours, such as safer sex practices, may encompass a more proximal socially evaluative situation than physical activity, which could explain why SNs are the superior predictor of risk behaviours. On the other hand, although physical activity may often be performed in a social context, it is not necessary to do so. Exercising personal control and one's overall evaluation of the behaviour may be more relevant to behaviours performed individually. Importantly, intention is a strong predictor of all health behaviours and still remains a significant predictor for physical activity and dietary behaviours when past behaviour is included in the model. Considering physical activity specifically, intention was the most important predictor of physical activity from the TPB constructs, adding a statistically significant 10.3% of variance over and above past behaviour.

The TPB has been shown to be an effective model at predicting exercise in rehabilitation settings. Attitudes, PBC, and intention have all been found to make consistently significant contributions to the prediction of exercise in centre-based

cardiac rehabilitation (Blanchard, Courneya, Rodgers, Daub, & Knapik, 2002; Blanchard et al., 2003) as well as home-based cardiac rehabilitation (Blanchard, 2008). This model may be particularly useful in assessing exercise in rehabilitation settings because it is a framework for understanding volitional behaviour. Patients with COPD who are referred to exercise-based PR often make a great effort to attend PR because of their physical limitations (i.e., breathlessness, and physical weakness due to age and inactivity). Therefore, it can be construed that an individual exerting a great amount of effort to even attend a PR session has a strong intention to perform the behaviours at the rehabilitation program.

Social Cognitive Theory

SCT contends that human motivation and behaviour is primarily regulated by forethought (Bandura, 1997). In this theory, there are a number of critical constructs that impact behaviour. Self-efficacy is the most proximal and important construct that influences behaviour and is "a judgment of one's ability to organize and execute given types of performances" (Bandura, 1997, pp. 21). Outcome expectations are a "judgment of the likely consequence such performances will produce" (Bandura, 1997, pp. 21). It is generally thought that those who consider themselves to be highly efficacious will expect favourable outcomes, whereas those who expect to perform poorly expect negative outcomes. This model also includes goals, perceived impediments and opportunity structures, although SE and outcome expectations are considered the core constructs. Both SE and outcome expectations directly influence goals and behaviour. Bandura (2004)

describes goals as desired behaviours that people plan to engage in, and makes a distinction between proximal and distal goals, both of which are important for behavioural enactment. According to Bandura, proximal goals (e.g. I aim to do x) are the same as intentions (e.g., I intend to do x) from the TPB. Whereas distal goals situate the course of behaviour change, proximal goals are important for self-regulation in order to control and subsequently change behaviour (Bandura, 2004). Self-efficacy impacts the goals that people set and the challenges that people will take on. That is, a person who is very confident for performing the behaviour will set much different goals than someone who has very little confidence for performing the desired behaviour. It is contended, therefore, that people with strong SE will set challenging goals and be persistent at perusing them (Bandura, 1997).

Self-efficacy is regarded as an integral construct in social cognitive models of health behaviours (Conner & Norman, 2005). In fact, SE has been demonstrated to be a reliable predictor of behaviour, including, sexual risk behaviours (Dilorio, Hartwell, Hansen, & Prevention, 2002), nutrition and weight control (Schnoll & Zimmerman, 2001), addictive behaviours (Dijkstra & De Vries, 2000), and physical activity (Dzewaltowski, Noble, & Shaw, 1990; Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002). Furthermore, in predicting physical activity participation, research has indicated that SE is a robust predictor, and may be a superior predictor to PBC and intentions to participate in physical activity (Dzewaltowski et al., 1990).

Self-efficacy has been found to be a reliable predictor of initiation and maintenance of physical activity (Bandura, 1997). Furthermore, SE for exercise is widely accepted to be a multidimensional construct (Maddux, 1995). According to Maddux, SE comprises the elemental aspects for performing the behaviour of interest (i.e., task self-efficacy), as well as coping with barriers that may impede enactment (i.e., coping or barrier self-efficacy). A variety of other scholars have adopted this view, although the operationalization of SE for exercise is not consistent. For example, in addition to Maddux's conceptualizations of task SE and coping SE, an additional subtype of coping SE has been proposed, scheduling SE, which is defined as the confidence for scheduling time to participate in exercise (Rodgers & Sullivan, 2001).

Research has indicated that the type of SE most important to physical activity participation is largely contingent on the abilities and context of performing the activity. For example, Millen and Bray (2008) found that during cardiac rehabilitation task SE was the strongest predictor of physical activity; however one month post rehabilitation, barrier SE was the strongest predictor of physical activity. Similarly, Rodgers et al. (2002) found task SE to be related to exercise initiation, and scheduling SE the most important predictor of sustained physical activity (Rodgers, Murray, Courneya, Bell, & Harber, 2009) . In tertiary prevention settings, task SE is the best predictor of physical activity because the context of the rehabilitation program focuses on the physical capabilities of performing the activities (i.e., walking for 20 minutes without stopping). Furthermore in tertiary prevention programs, patients tend to have a structured

pre-determined schedule for participating in physical activity and support staff to help them cope with barriers they encounter, making confidence for scheduling their activity less pertinent. After rehabilitation, however, when patients are encouraged to participate in physical activity on their own, they are faced with a new set of challenges such as scheduling time to do the activity and perform the activity under challenging circumstances. As the impact of SE type is contingent on the phase of activity adoption (Luszczynska & Sutton, 2006), scheduling SE becomes the key predictor once rehabilitation has ended. Comparable with this assertion, Luszczynska and Sutton showed that after rehabilitation, maintenance SE was the strongest predictor of behavioural persistence in those who were still exercising as recommended. However, this relationship was not present in those who were not exercising as much as was recommended. In those who were not exercising at prescribed levels, recovery SE was the strongest predictor of exercise behaviour. So while confidence for performing relevant tasks is a necessary component to performing physical activity, it is not sufficient for long-term behavioural enactment (Millen & Bray, 2008; Rodgers et al., 2002; Rodgers et al., 2009). Being confident in one's ability to perform the activity in the face of impediments and scheduling time to do the activity are essential for sustained activity.

Patients with COPD who attend PR acquire exercise-based skills. As the patients progress through the PR program it is likely that their exercise-based cognitions will change. Multidimensional SE for exercise may be a particularly important construct to examine in this setting as patients likely go through various

phases of exercise adoption and maintenance. Self-efficacy is a construct that not only predicts exercise behaviour, but is also understood to be multifaceted in that it takes into account the physical, coping, and scheduling aspects of performance. Self-efficacy is the construct most often studied from SCT, and as such is well defined and conceptualized. Social cognitive theory as a whole may be useful for understanding behaviour; however the relationships among the variables are complex. It may be due to this complexity that the model is often not studied in its entirety which may contribute to the relationships between constructs being less well conceptualized compared to a simpler model, such as the TPB.

Health Belief Model

According to the HBM, individual differences in health behaviour can be understood by a framework of health-related beliefs. The most recent version of the model is composed of six constructs (Becker, 1974). The hub of the model focuses on two aspects of health-related cognitions: threat perception and behavioural evaluation. Threat perception is defined in terms of two key beliefs, perceived susceptibility to illness and anticipated severity of the consequences of illness. Behavioural evaluation is also understood in terms of two beliefs, the benefits associated with the recommended health behaviour and the costs or barriers to performing the behaviour. The remaining two constructs in the model are cues to action and general health motivation. In this model, cues to action are triggers that can initiate the target health behaviour, such as perception of symptoms, influence from the social environment, and health-related education

campaigns. Health motivation is the final construct in the model which is considered an individual's readiness to impact their own health matters.

One critique of the HBM is that it lacks clearly operationalized constructs and links between many of the constructs (Abraham & Sheeran, 2005). For example, it is unclear what the weighted contributions are of perceived severity and perceived susceptibility to overall threat perception. Likewise, there is some uncertainty of whether perceived costs/barriers and perceived benefits are weighted against one another to determine overall behavioural evaluation, and what formula should be used if this idea is adopted. The lack of clarity associated with the operationalization of constructs has weakened the status of the HBM among other health-related social-cognitive models (Harrison et al., 1992). However, the model consists of intuitively appealing cognitions that appear to have some association with health behaviour.

The HBM has been applied to the prediction of an extensive range of behaviours and populations. A majority of empirical research has focused on the predictive ability of the four major constructs, perceived susceptibility, severity, cost/barriers, and benefits. A review by Janz and Becker (1984) calculated a significance ratio that indicated the percentage of times each HBM construct was found to significantly predict health-related behaviour. This review found that perceived susceptibility, severity, costs/barriers, and benefits were significant in 81, 65, 89, and 78 percent of the studies, respectively. In a later review examining the size of the effects between the four constructs and behaviour, Harrison et al. (1992) found that barriers were most strongly correlated to health behaviour (r =

0.21), followed susceptibility (r = 0.15), benefits (r = 0.13), and severity (r = 0.08). Although the four major constructs in the HBM predict health behaviour frequently, the small effect sizes suggest that the predictors may not be particularly important. Harrison et al. noted that there was considerable variability in the size of effects across the studies. This may indicate that although studies used the same labels for their measures, it is possible that they were actually measuring different constructs. The lack of consistency across operationalization of constructs may contribute to the large variation in the size of the effects, and also to the overall small effects between the constructs and behaviour. Furthermore, Abraham and Sheeran (2005) point out that the effects of individual health beliefs may not be as advantageous as the effects of the combined constructs of the model.

To further understand the predictive utility of the HBM on health behaviours across behavioural contexts, a review by Janz and Becker (1984) examined the four key constructs in preventative, sick role and clinic use behaviours. Across preventative behaviours (i.e., actions taken to avoid illness or injury) barriers significantly predicted the behavioural outcome measure in 93 percent of the studies, followed by susceptibility, benefits, and severity, predicting 86, 74, and 50 percent of the outcomes, respectively. When reviewing sick role behaviours (i.e., actions taken after diagnosis of a medical problem in order to restore good health or to prevent further diseases), barriers had the greatest predictive utility (92 percent) followed by severity (88 percent), benefits (80 percent) and susceptibility (77 percent). In the review by Janz and Becker, only

three studies examined clinic use (i.e., clinic utilization for a variety of reasons). Of the three studies, benefits significantly predicted the behavioural outcome measures in all studies, susceptibility in two of three studies, severity in one out of three, and barriers in one out of two studies. Perceived severity, although an important construct in predicting sick role behaviours was only significant in predicting preventative behaviours half of the time. This difference may be due to the proximity of the perceived threat. In preventative behaviours, such as exercise, the threat of becoming ill may be perceived as being quite distant and alien to the individual. With sick role behaviours, illness has already been identified and is therefore more proximal and salient to the individual. As age, and other population moderators were not examined in the review by Janz and Becker, it would be interesting to determine if the importance of the HBM constructs varied across populations within and between health behaviours.

The HBM consists of constructs that appear to have some importance in predicting health-related behaviour, although the relationships among constructs appear to be unclear. So although the model may not be particularly desirable as a whole in the current form, the constructs may still be relevant in predicting health behaviour. Some of the constructs may be particularly important when studying exercise in COPD patients attending PR. The reviews above suggest that when illness has been identified, the perception of severity of the illness is important in predicting health-related behaviour. Perceived severity is a unique construct to other social cognitive models and may offer insight into the exercise participation of patients with COPD. It would be interesting to determine the importance of

perceived severity in predicting exercise when it is considered among other well studied constructs, such as SE and attitudes.

Social Cognitive Theories in Pulmonary Rehabilitation

Based on a recent literature review, few studies have been conducted in exercise-based PR that have been framed around theoretical models. Self-efficacy is one social cognitive construct that has received some attention in PR. Due to the salience of breathlessness to individuals with COPD, a majority of the SE scales in this population have examined patients' confidence for managing or avoiding breathing difficulties (i.e., COPD SE scale: CSES; Wigal, Creer, & Kotses, 1991), and few have assessed confidence for participating in physical activity. One SE scale developed for use in PR patients assesses both confidence for controlling symptoms (i.e., breathing difficulties), and confidence for maintaining function (i.e., participation in physical activity)(Sullivan, LaCroix, Russo, & Katon, 1998). Interestingly, only confidence for maintaining function made a significant contribution to the explanation of health status after rehabilitation (Arnold et al., 2006). Since efficacy beliefs have been demonstrated to be related to behavioural enactment (Bandura, 1997), this finding further supports the positive association between exercise and clinical indicators of PR. Furthermore, if the performance of exercise is related to clinical indicators of PR, it seems necessary to further explore factors that are associated with exercise, such as SE and other social cognitive variables.

Integrating Theoretical Constructs

Integrating the most important predictors of physical activity and examining their relationship to behaviour in COPD patients may have important practical and theoretical implications. Examining theoretical constructs from multiple theories simultaneously may help to determine which constructs are the most important when assessing physical activity in COPD patients and determine if there are redundant constructs across theories. Due to the scarceness of social cognitive research on exercise in COPD patients, it seems that exploration of cognitive constructs is warranted.

The three models reviewed here, TPB, SCT, and HBM, are optimal models from which to pull theoretical constructs from due to the similarity in their underlying premise: that health-related behaviour can best be understood by a set of interrelated cognitions. The TPB is a parsimonious model that has clearly defined relationships among constructs, and therefore may be a good foundational model to start from. From this model, attitudes, and PBC have emerged as the most important predictors of intention and physical activity, with intention being the most reliable predictor of physical activity. Self-efficacy, from SCT, is argued to be one of the most important motivational constructs from any social cognitive model due to its strong and consistent relationship to behaviour, and has been well defined and studied extensively in exercise settings. Rodgers et al. (2008) have identified SE and PBC to be distinct predictors of health-related behaviours. Whereas SE is defined as one's belief in their capabilities to perform a behaviour, PBC is defined as one's perception of control over a specified behaviour.

Therefore, both of these constructs may be important to consider, although as indicated by Rodgers et al., SE may be the superior predictor of the two. The HBM seems to have a number of important predictors of behaviour; however the relationships among the constructs are not well defined. Therefore, using constructs from this model may be useful to determine their relationships to other more well-defined models of health behaviour. From the HBM, barriers have been identified as the most important predictor of physical activity. Although perception of illness severity was the construct least associated with physical activity in the HBM, it was the most important predictor in sick role behaviours. As sample characteristics were not analyzed as moderators, perception of illness severity may be particularly relevant to exercise behaviour in the COPD population.

The social cognitive theories reviewed provide insight into the relationships among cognition and physical activity. However, more research needs to be conducted to determine the important cognitive constructs in exercise-based settings among patients with COPD. As the models discussed are based on the underlying beliefs of individuals, it seems important to start at the source and assess the beliefs in this population in order to determine which social cognitive constructs are most relevant to exercise participation. A method for determining and understanding such cognitions is necessary and discussed below.

Internal Dialogue (Self-talk) as a Tool for Understanding Cognition

The relationship between thought, language, and behaviour has been interesting to philosophers, psychologists, and cognitive scientists (Meichenbaum,

1977; Plato, Hamilton, & Cairns, 1961; Vygotsky, 1962). In fact, early philosophers, such as Plato, theorized about the associations of thought and language to human action. In Theaetetus, Socrates describes the process of thinking

> "as a discourse which the mind carries on with itself about any subject it is considering...when the mind is thinking it is simply talking to itself, asking questions and answering them, and saying yes or no" (Hamilton & Cairns, 1961 p. 895).

From this point of view, three things can be inferred. First, that conscious thinking is a dialogue, or communication that one engages in with one's self. The second point, which is related to the first, is that language and thought are intimately related to one another. This leads to the third point, that personal dialogue is a mechanism for understanding cognitive content and function. Modern psychologists have continued the scientific study of internal dialogue, which is referred to in many ways, such as inner speech, private speech, verbal rehearsal, egocentric speech, self-verbalizations, self-instructions, self-statements, and most commonly – self-talk. There are also many definitions of internal dialogue; however, the label and description proposed by Meichenbaum (1977) seems to provide the most detailed account. Meichenbaum prefers the term internal dialogue, suggesting the important element of not only speaking to oneself but listening to oneself. Similar to Plato, Meichenbaum contends that internal dialogue is the silent conversation that one has with oneself about their thoughts and feelings, and is a self-communication system that influences behaviour. In

this view, internal dialogue is the script of underlying cognitive structures, which in turn influences affect, thought, and behaviour. Furthermore, this definition infers that internal dialogue is conscious and is self-directive. It is these characteristics that make internal dialogue a seemingly good vehicle in which to understand intentional behaviour, which is thought to be best explained by social cognitive approaches.

Self-talk in Developmental Psychology

Developmental psychology makes an important distinction between overt and covert self-directed verbalizations. Overt verbalizations that are addressed to oneself are referred to as private speech, whereas covert verbalizations are fully internal, or inside one's head and referred to as inner speech (Winsler, Fernyhough, & Montero, 2009). According to Vygotsky (1962), private speech occurs very frequently in preschool and elementary aged children and originates from the child's social world and the interactions that the child has with others. At a young age, speech from parents to their children functions as a guide to regulate the child's attention and behaviour. As the child grows older, the child speaks out-loud to themselves as a means to regulate their own behaviour, and engages in self-reflection and self-regulation. Over time, private speech turns into inner speech, whereby a person begins to self-regulate silently. In adulthood, a vast majority of self-directed speech and self-regulation is silent.

In sum, Vygotsky (1962) believed that self-directed speech primarily serves a self-regulatory function. More specifically, Vygotsky contended that the amount of self-directed speech would increase as the task became more difficult,

because a more difficult task would require greater self-regulation. Evidence for Vygotsky's hypothesis was found from research on the performance of children 2, 3.5, and 5 years of age on a puzzle solving task (Behrend, Rosengren, & Perlmutter, 1989). The results indicated that the frequency of self-talk, without analyzing content characteristics, was positively related to performance on the puzzle solving task. In regards to task difficulty, it was found that the greatest amount of verbalizations occurred when the children were working on puzzles that were at or just above their ability level. Behrend and colleagues concluded that when a task is easy for a child the regulatory functions have been internalized and little private speech will occur. As tasks become more difficult it is expected that self-regulatory self-talk should increase, but only up to a certain point. When the task is too difficult and children do not have the self-regulatory capability to adequately deal with the task at hand, behaviour will either be unregulated or unsuccessful. Therefore, it is believed that the amount of self-talk produced is relative to the abilities of a particular individual. The research by Behrend et al. points to the relationship between frequency of self-talk and task difficulty, however, the authors did not examine the content of the self-talk. As such, inferences cannot be made in regards to how characteristics of self-talk relate to task performance, self-regulation, or to phase of skill acquisition.

The self-regulatory function of self-talk has some interesting implications for patients with COPD who are beginning to participate in exercise. According to Vygotsky, (1962) children engage in private speech (overt speech) due to immaturity of higher-order cognitive processes, but as people age, private speech

turns into inner speech (covert speech), until adulthood when practically all self-directed speech is silent. This makes the task of measuring adults' self-regulated speech much more difficult than that of children. Being that children's self-regulated speech occurs out-loud, prompts are not required in order to access the content of the speech. In order to tap into the content of adults' self-regulated speech, verbal prompts will need to be made, which require the researcher to ask the right questions and the participants to be self-aware of the content of their inner speech.

The other interesting implication for COPD patients' participation in exercise is in regards to task difficulty. Work from Behrend et al. (1989) might suggest that little self-regulatory speech will occur when exercise tasks are too easy for the patients, or too difficult, with moderate task difficulty producing the greatest amount of self-regulatory speech. Many patients with COPD entering PR have had little experience with exercise tasks and may therefore be initiate exercisers. It may be that for initiate exercisers, the exercise tasks may be difficult resulting in little self-regulatory speech, making it difficult to access the content of their self-speech. As the patients become more comfortable performing exercise tasks, more self-regulatory speech may occur, making the content of self-speech easier to assess. If the exercise tasks become too easy for the patients, self-regulated self-speech may cease to occur. However, as patients with COPD are quite impaired, it is difficult to imagine exercise tasks becoming too easy for this population. Illness severity then may be an important factor that impacts self-regulation and self-speech. It may be particularly interesting to determine the

amount of exercise-related self-speech that occurs in patients with COPD and see if it varies according to task difficulty and illness severity. However, it also seems important to determine what the content of the self-speech is as well, to see how that impacts subsequent self-speech and behaviour.

What also may be important to consider is that the exercise tasks change as the setting changes. Therefore, it is important to consider the range of tasks that occur as the setting changes. During rehabilitation, the content, location, and time that the exercise is to take place is predetermined, and support staff are on site to assist patients. After rehabilitation, however, patients are fully reliant on themselves to dictate their exercise regime. Patients may adjust to the performance of tasks while in rehabilitation, however once out of rehabilitation, the setting for the performance of the tasks changes. Therefore, it may be important to assess patients' self-regulatory abilities for tasks that occur in and out of rehabilitation.

Self-Talk in Clinical Psychology

The premise of cognitive psychotherapy is to assess, understand, and modify the thoughts and perceptions of individuals and the specific statements that they say to themselves (Cacioppo, von Hippel, & Ernst, 1997; Meichenbaum, 1977). In this area, the focus is not on the self-regulatory functions of the individual per se, but on the content of the self-talk statements as being a window into the nature and valence (i.e., either positive or negative) of people's thoughts about themselves and perceptions of their environments. In this literature, researchers contend that positive and negative statements are differentially

associated with adaptive and maladaptive psychological functioning (Cacioppo et al., 1997; Calvete & Cardenoso, 2002; Schwartz, 1997). When comparing clinical and non-clinical populations on the valence of their self-talk, it is generally found that clinical populations engage in more negative/maladaptive self-talk than non-clinical populations, and that the content of their self-talk is relative to their psychopathology (Calvete & Cardenoso, 2002; Wang, Brennen, & Holte, 2006). For example, anxious and depressed patients tell themselves that bad things are going to happen so there is no point in even trying (Wang et al., 2006). It is unclear however, whether it is the mere presence of positive self-talk that matters most for successful adjustment (Burnett, 1996), or the lack of negative self-talk (Ronan & Kendall, 1997), or whether it is the ratio of positive to negative self-talk that is most important for predicting mental health.

The states-of-mind (SOM) model contends that a specific ratio of negative to positive self-statements accounts for optimal emotional adjustment, and that psychopathology occurs when this ratio shifts (Schwartz & Garamoni, 1986). SOM ratios are calculated by dividing positive self-statement scores by positive plus negative self-statement scores (Calvete & Cardenoso, 2002). Research on SOM ratios has found that having a ratio of positive to negative self-talk falling between 0.62 to 0.90 is the optimum range associated with the most highly competent and adaptive persons with depression and anxiety (Schwartz, 1997; Schwartz & Garamoni, 1986), persons coping with stress (Schwartz & Garamoni, 1986), and adolescents with and without behavioural problems. The research in this area indicates that the content and the valence of self-talk lies along a vast

spectrum, and that the content of the self-talk is related to psychological functioning. Furthermore, the research on the SOM model suggests that there may be an optimal negative to positive ratio which could predict the enactment of exercise in patients with COPD.

In addition to being a useful vehicle to understand the cognition of those with psychopathologies, self-talk may also be a way to tap into the cognitions of individuals without psychopathologies. Moreover, as changing maladaptive cognitions by altering self-talk is a fundamental principle of cognitive therapies; it may also be an optimal route for changing maladaptive cognitions in other populations without psychopathologies.

Self-talk in Educational Psychology

A recent study in educational psychology has demonstrated that social cognitive constructs can be operationalized as self-talk statements and that these statements may be valid predictors of behaviour (Oliver, Markland, & Hardy, 2010). Oliver et al. developed controlling and informational self-talk statements from autonomy-supportive and autonomy-controlling operational definitions from the self-determination theory (Deci & Ryan, 1985), and examined the relationships between the self-talk statements, understanding of a lecture, and post-lecture affective states. Participants rated the extent to which self-talk statements 'made them feel that they had no control over the situation' (i.e., controlling self-talk), and the extent to which the statements 'reassured them that they were in control' (i.e., informational self-talk). The authors found that high levels of controlling self-talk were associated with poor understanding and poor

experience of the lecture, as well as high levels of negative affect, unlike the informational self-talk statements (Oliver et al., 2010). The results from this study indicate that how one interprets self-talk is related to their affective states, as well as their experience and understanding of a lecture. This research is consistent with Vygotsky's conception of the relationship between the frequency of self-talk and self-regulation, however this research takes into consideration the content of the self-talk statements as much as the frequency. Furthermore, this study suggests that interpretation of self-talk content is an important aspect to be considered in the self-talk literature, and that self-talk statements can be derived from social cognitive constructs. Research should be done in patients with COPD to determine which social cognitive constructs are relevant to their self-talk around exercise participation, and determine the nature of the relationship between content, frequency, and exercise participation.

Self-talk in Sport Psychology

In sport psychology, the main body of research on self-talk pertains to the identification and understanding of the content of athletes' self-talk, the functions that the self-talk might serve to the athlete, the frequency of such speech, and the relationship between self-talk, motivation and sports performance. Another aspect of self-talk that has been identified as important in this area, although it has not received much attention, is how an athlete responds to the self-talk statements (Van Raalte & Cornelius, 2000), thus placing an emphasis on self-talk being evaluative. An important note is that the literature in this area does not make a distinction between overt and covert self-statements. The argument is that

whether the individual goes through the extra step of creating the auditory sounds is irrelevant. What is most important is the meaning, content, and function of the self-statements, which would be the same if the statements were audible or not (Hardy, 2006). Hardy also points out that whether overt or covert self-talk influences the quality of performance may be an interesting empirical question to be examined in the future. This same question may also be relevant for the research on self-talk in COPD patients participating in exercise.

Valence is the most widely studied characteristic of self-talk in athletes. Valence refers to the bi-polar descriptors of positive and negative self-talk (Hardy, 2006). There are two alternative perspectives regarding the influence of the valence of self-talk. One perspective contends that positive and negative self-talk is thought to represent praise and criticism, respectively (Moran, 1996). Moran's view implies that there are two elements associated with valence, content and encouragement. Another perspective is that positive self-talk assists, whereas negative self-talk hinders performance (Hardy, 2006). As Hardy points out, this view is much broader and allows for inclusion of both encouragement and instruction, which may positively influence performance. As a majority of the research on positive and negative self-talk is predominantly focused on its subsequent influence on the quality of performance, the latter perspective on the valence of self-talk is most commonly adopted. The difficulty with this definition however, is that it is completely dependent upon its impact on behaviour, making it hard to separate out the characteristic of the self-talk statement and the behaviour from one another. Nonetheless, the definitions of positive and negative

self-talk are similar to that adopted in clinical psychology, in that the definitions are tied to how a person functions. Whereas functioning in clinical psychology is related to a person's psychopathology, functioning in sport psychology is related to a person's sport performance. What may also need to be considered is that the valence of the self-talk is determined by the researcher. However, the valence/content of the self-talk can be interpreted by the individual who is engaging in the self-talk. Thus, the interpretation of the self-talk content may be as or more important than the content of the self-talk per se.

The results regarding the effects of positive versus negative self-talk on performance are mixed. Although it is generally thought that positive self-talk assists performance and negative self-talk is detrimental to performance (Zinsser, Bunker, & Williams, 2010), a recent meta-analysis on the effects of self-talk and sport performance found that positive self-talk had a positive effect on performance quality, however negative self-talk had no effect on performance quality (Tod, Hardy, & Oliver, 2011). Some researchers have suggested that this finding may be due to some athletes interpreting their negative self-talk as motivational (Van Raalte & Brewer, 1994), thus highlighting the need to consider individual's interpretation of their self-talk content. However, there have only been 5 studies that directly compare whether positive or negative self-talk is better at enhancing performance. Of the 5 studies, 3 indicated that positive self-talk was more beneficial than negative self-talk and 2 indicated that there was no performance differences between positive and negative self-talk. More studies need to be conducted however, before firm conclusions can be drawn. What

should be considered in this research area is the bidirectional relationships between the valence of self-talk and performance. That is, speech is related to performance and performance is related to speech. To complicate the matters further, both the content of speech and performance of behaviour are subject to interpretation by the individual engaging in it, which may influence subsequent performance and speech, respectively. It would be useful to conduct a study that examines self-talk before and after performance.

There is a methodological consideration that should be acknowledged when studying the valence of self-talk. Adopting a social-cognitive perspective, participants are active agents in their environments. Thus, what may be classified as positive to one individual may be considered to be negative by another individual. Likewise, what may be motivating to one person may be demotivating to another, regardless of whether the statement is positive or negative. In the self-talk literature in sport psychology, the valence of athletes' self-talk statements is classified by researchers and may not reflect participants' own interpretation or assessment of their self-talk statements. Rather than simply assessing the valence dimension of exercise-related self-talk statements in patients with COPD, it may be more useful to assess the motivational evaluation of self-talk statements to the individual. This way, the focus is on the meaning of the self-talk statements to the individual. Whether a statement is positive or negative can be inferred by the researcher.

Another common characteristic of self-talk that is assessed in sport psychology is function. The research on the function of self-talk highlights that

self-talk is a conscious, deliberative dialogue that contains cognitive elements, which ultimately impact behavioural performance. The function of self-talk in sport psychology refers to the purpose that an athlete may have for employing self-talk. Two functions have been identified: instructional and motivational (Hardy, Gammage, & Hall, 2001; Theodorakis, Weinberg, Natsis, Douma, & Kazakas, 2000). Instructional self-talk addresses technical, tactical, and/or kinesthetic aspects of movements, whereas motivational self-talk centres on enhancing self-confidence, increasing effort, and enhancing or creating positive moods (Tod et al., 2011). Some research has suggested that instructional self-talk is more effective than motivational self-talk for performing tasks that are precision based and require fine motor skills and that motivational self-talk is more effective than instructional self-talk for performing physical conditioning tasks (Theodorakis et al., 2000). Given that exercise-based regimes for patients with COPD do not focus on fine motor skills and that adherence to exercise regimes in rehabilitation settings is typically low, it is likely that motivational self-talk would be more relevant than instructional self-talk in this setting. There may also be other functions of self-talk for exercise in patients with COPD. Research should determine if motivational self-talk is in fact of function of self-talk in this setting, and if other functions exist. As proposed by Vygotsky (1962), self-talk may primarily serve a self-regulatory function. To determine if self-talk is a self-regulatory function in patients with COPD participating in exercise, the relationship between the frequency of exercise-related self-talk and performance on clinical indicators in this context (i.e., health status and 6MWT) should be

assessed. Also, the specific motivational content, according to relevant motivational theories, needs to be considered.

Similar to developmental psychology, there has been an interest in sports psychology in the frequency of self-talk statements. One study suggests that successful adult athletes engage in more self-talk than less successful athletes (Hardy, Hall, & Hardy, 2004). However, another study found that greater self-reported frequency of self-talk was not related to athlete skill level (Hardy, Hall, & Hardy, 2005). Winsler et al. (2009) interprets these findings as it may not be the overall quantity of self-talk that separates distinguished from poor athletes, but how the athlete interprets and responds to such speech. Considering Vygotsky's (1962) account that self-talk primarily serves a self-regulatory function, it may be that athletes self-talk is related to task difficulty. Skilled athletes may find that the task is less difficult than intermediate athletes, therefore requiring less self-regulation and subsequently less self-talk. Likewise, beginner athletes may find the task too difficult and engage in little self-regulation and self-talk. Research in this area should consider this possibility. In exercise-based settings with COPD patients, it may be important to consider the frequency of self-talk due to its association with self-regulation. However, it may be more important to focus on the content and interpretation of the self-talk statements in order to understand the underlying cognitive structures in this population.

There has been limited theoretical research on the content of self-talk in sport psychology; however there has been a recent interest in the potential mechanisms that may facilitate the effect of self-talk on performance (Hardy,

2006). Self-efficacy has been identified as a potential mechanism of the influence of self-talk on sport performance, however it has not yet been tested directly, and its influence has only been inferred. It is thought that self-talk may be intimately related to one of Bandura's (1997) sources of SE: verbal persuasion. The idea is that saying positive things to one's self can also persuade the self to have stronger SE beliefs about a behaviour (Hardy, 2006). For example, one study reported that tennis coaches use positive self-talk to build efficacy (Weinberg, Grove, & Jackson, 1992). Also, in a study conducted by Van Raalte et al. (1995), Hardy (2006) attributed the beneficial effects of positive self-talk (i.e. I can) on performance to SE. As these studies offer only speculation and do not specifically measure the relationship or impact of SE on performance, further research should be conducted in this area before a causal association of SE and self-talk can be made. Importantly however, researchers are beginning to gain interest in the role of social-cognitive constructs in the self-talk literature. It would be interesting to determine if SE and other social cognitive constructs can be found in COPD patients' self-talk about exercise. As self-talk (internal dialogue) is evidence of underlying cognitions, it could be expected that this in fact would be the case. Research should be done to determine which social cognitive constructs can be identified in COPD patients' self-talk statements about exercise. Furthermore, if social-cognitive constructs are found in COPD patients self-talk statements, self-talk may emerge as a potentially effective intervention technique.

Self-talk in Exercise Psychology

Of the few studies conducted examining self-talk in exercise, a majority of them have been qualitative. Importantly however, the descriptive research in exercise psychology suggests that people use and are aware of their self-talk when thinking about exercise and physical activity (Fuller, Stewart Williams, & Byles, 2010; Gammage, Hardy, & Hall, 2001; O'Brien Cousins, 2003). When thinking about exercise, infrequent and frequent exercisers tend to engage in both positive and negative self-talk (O'Brien Cousins, 2003). O'Brien Cousins defined positive self-talk as statements that were more likely to facilitate physical activity participation, and negative self-talk as statements more likely to end further thinking about physical activity participation. The self-talk content included self-regulatory thoughts, thoughts about exercise, and thoughts about outcomes. O'Brien Cousins found that active people engaged in just as much negative self-talk as inactive people. The difference between inactive and active adults was that the active adults tended to respond to every negative thought with a positive thought, and every perceived barrier with a solution which may ultimately help them to participate in more physical activity. Indeed, self-talk is frequently used by exercisers for motivational purposes, to cope in difficult situations and for encouragement to attend their physical activities (Gammage et al., 2001). As self-talk is a dialogue (Meichenbaum, 1977), it is important to study not only the content of the self-talk statements, but also how the statements are responded to. The response to self-talk statements is influenced not only by the content, but also by the interpretation of the content to each individual. In order to have the clearest

understanding of how self-talk relates to behaviour, it is important to examine the content of self-talk in addition to the interpretation of self-talk statements.

Self-Talk Assessments

According to Glass and Arnkoff (1997), a comprehensive self-statement assessment considers four dimensions: structure (endorsement versus production), timing (retrospective, concurrent, or about future events), response mode (written or oral), and nature of the stimulus (thoughts in general, imagined situation, situation viewed on videotape, role-play, or in vivo situations). In terms of structure, endorsement methods possess the highest degree of structure and are usually in the form of questionnaires or inventories (Glass & Arnkoff, 1997). On the other end of the continuum of structure are production methods, in which participants are asked to generate or recall their thoughts, such as thought-listing, videotape-aided thought recall, and think aloud (Glass & Arnkoff, 1997).

There are a variety of advantages and disadvantages to using endorsement and production methods. The advantages to using endorsement methods (i.e. questionnaires), is that they are brief, easy to administer and score, and, unlike production methods, require no subjective scoring of experimenter determined thought protocols, which may be confounded with reliability issues. These advantages allow for comparison across studies and assessment of psychometric properties. A disadvantage to using endorsement measures to assess self-talk is that the statements in the questionnaire may not reflect the participants' actual thoughts. As a result, the participants' thoughts may not be fully captured. An additional disadvantage is that responses are subject to possible selective memory

biases, in which participants may report what they thought that they should be thinking. Endorsement methods also only capture a narrow range of thoughts, whereas production methods can generate a rich sample of clients' self-statements. However, production methods are extremely time consuming, and do not allow for easy comparison across samples. Production methods will be beneficial when constructing a self-talk assessment in that it will generate a wider variety of self-statements. Since there will be many other measures collected in this study, however, endorsement measures may be more appropriate due to participant burden and time constraints. Also, endorsement methods would allow for cross-sample comparisons to be made in future studies.

The second dimension to be considered according to Glass and Arnkoff (1997) is timing. Self-statement questionnaires are usually administered retrospectively, although they can be assessed in anticipation of a situation, or during the situation itself (Glass & Arnkoff, 1997). This study is concerned with participants' general thoughts about exercise; while they are performing exercise, but also when they are considering participating in exercise. Therefore, the questionnaire will be administered retrospectively, so that all thoughts about exercise can be captured simultaneously. Retrospective recall does present memory bias problems which will need to be considered when interpreting the results.

The final two dimensions to be considered are response mode and nature of the stimulus (Glass & Arnkoff, 1997). The response mode of questionnaires can be written or oral, although oral methods are generally only used with young

children or those who may not have advanced enough reading skills in order to avoid comprehension difficulties. All participants in this study will have reading skills advanced enough to respond to the questionnaire, and so the response mode of choice will be written. The final dimension to be considered is nature of the stimulus. In this case, thoughts in general are of interest with some concentration of thoughts in particular situations.

The content and characteristics of self-talk that is assessed is perhaps just as important as the dimensions of the self-talk measure. After reviewing self-talk measures in Sport, Developmental, and Clinical Psychology, there seems to be three categories of self-talk content that is measured. The first category assesses the frequency of positive and negative self-talk content (i.e., valence). The second category assesses the properties of speech (i.e., dialogue versus monologue, grammatical structure and quality, and who the speaker is). The third and final broad category assesses the frequency of the functions of self-talk statements (i.e., social assessment, self-criticism, self-reinforcement, and self-management). After a thorough review, there was no measure found that assessed all three of these content characteristics simultaneously.

Valence is the most commonly assessed content characteristic in self-talk questionnaires. In fact, the literature review conducted above indicated that it is common in Clinical, Sport, and Developmental Psychology. In clinical psychology, the Automatic Thoughts Questionnaire Revised (ATQ-R; Kendall, Howard, & Hays, 1989) is the most frequently used measure of self-talk valence to assess depression and anxiety, and has been found to differentiate between

clinical pathology and lack of psychopathology, and sensitivity of treatment. In Sport Psychology, the Automatic Self-talk Questionnaire for Sports (ASTQS; Zourbanos, Hatzigeorgiadis, Chroni, Theodorakis, & Papaiciannou, 2009) has been developed to assess the content of athletes' self-talk. In these assessments, positive and negative statements are presented and participants are asked to rate how frequently they have each of the thoughts listed. Possible responses are on likert-type scales. The self-talk items in the ATQ-R and ASTQS are grammatically simple and easily understood, making it an ideal assessment for a variety of education levels. However, the ATQ-R is primarily concerned with assessing depression and may not capture exercise specific thought content. Likewise the ASTQS was developed to assess the thought content of athletes in competitive sport environments. As a result, while the ATQ-R and the ASTQS provide a good insight into the construction and grammatical detail of a questionnaire, the content of the measures may not be relevant to patients with COPD participating in PR; although some items used in the sporting questionnaire may contain items with applicable exercise content.

Whereas the self-talk assessments discussed above measure the general positive or negative thought content of individuals, the Self-Talk Inventory (STI; Calvete et al., 2005) assesses positive and negative self-talk content to a variety of imaginary situations. The STI was developed to assess self-talk content in young adults. In this assessment participants are asked to rate how likely they would say to themselves each of the 52 statements in response to a variety of age appropriate imaginary situations. Responses ranged from 1 (not very probable) to 4 (very

probable). The STI may be a particularly useful questionnaire as it provides participants with a context in which the self-statements might occur. Providing a context gives participants a more specific idea of what the researchers are asking for, and may allow for more accurate responses. However, since the imaginary situations in the STI are specific to young adults, the scenarios and responses are not relevant to COPD patients participating in PR.

In addition to assessing the valence of self-talk statements, there are also measures that assess the properties of speech that are present in self-talk statements. Four properties of speech have been assessed in self-talk questionnaires. The first is dialogicality. Dialogicality refers to whether self-talk occurs as a dialogue within the individual or a monologue. The dialogic nature of inner speech is thought to occur due to internalization of private speech and deemed to be crucial to healthy development (Vygotsky, 1962). Dialogicality is examined in the Varieties of Inner Speech Questionnaire (VISQ; McCarthy-Jones, & Fernyhough, 2011), which is a measure developed to understand the experience of inner speech to psychopathological variables in clinical and non-clinical populations.

The second property of speech that has been assessed is the voice that produces the speech content. That is, whether the sound of the voice is produced by other people's voices or by their own. Vygotsky contended that inner speech is developed as a result of social interactions of a child with his or her caregiver, and is associated with normal development. This property of speech is assessed in the VISQ.

The third property of speech is condensed versus expanded speech, which assesses whether self-talk statements occur as single words and short phrases, or as full grammatical sentences. This property of speech is examined in the VISQ, as well as the Self-Talk Usage Questionnaire (STUQ; Hardy et al.., 2005). The STUQ is a measure created to understand the content of athletes self-talk in practice and in competition. Research examining children's private speech has suggested that both condensed and expanded forms of speech are present in self-talk (Winsler et al., 2009).

The final property of speech that is assessed is whether the self-talk is said overtly (i.e. out loud) or covertly (i.e., silently to oneself). This "overtness" dimension of self-talk was examined in the STUQ and is thought to play a role in the athletes' success in competition; however, the specific association between overtness and performance has yet to be identified (Van Raalte & Brewer, 1994).

Considering the grammatical properties of speech may be particularly important to assess when linking self-talk, cognition and behaviour. In fact, recent research has linked the grammatical structure of self-talk to exercise related cognitions (Senay, Albarracin, & Noguchi, 2010). In an experimental study, Senay et al. found that engaging in interrogative versus declarative self-talk (e.g., Will I versus I will) resulted in greater motivation and intention to exercise. Interrogative phrases are in the form of a question, whereas declarative phrases are in the form of a statement. The focus of the present research is on self-talk content, as opposed to the grammatical characteristics of self-talk. So although grammatical characteristics will not be assessed, future research on self-talk

should consider measuring and examining the influence of grammatical properties on cognition and behaviour. Research on grammatical structure of statements may have particular relevance to the social-cognitive theories, which tend to use survey methods to assess constructs. If particular language or phrasing of statements can influence behaviour, some assessments of social-cognitive constructs may be biased. Also, the language and phrasing of intervention techniques could potentially be vastly improved.

The final category of self-talk content that has been assessed in questionnaires is the function that the self-talk statements serve to the individual. The function of self-statements is interested not in identifying the frequency that thoughts occur, but rather with the possible reasons or situations that a person might engage in self-talk. As a result, assessing the function of self-talk could potentially get at specific cognitive characteristics associated with self-talk, and provide insight into the meaning that the self-talk statements have to individuals. Indeed, research in Sport Psychology, has identified that athletes engage in self-talk for both cognitive and motivational reasons (Hardy et al., 2001). The cognitive function refers to developing strategies of play, and learning and performing sport skills. The motivational function refers to focus, self-encouragement, self-confidence, arousal regulation, coping, and mental readiness. The functions of athletes self-talk has been assessed in the Self-Talk Questionnaire for sports (S-TQ; Zervas, Stavrou, & Psychountaki, 2007), and may not correspond to the functions that COPD patients may have for engaging in exercise-related self-talk. A more general measure of self-talk function has been

developed for use with non-clinical adult populations (Brinthaupt, Hein, & Kramer, 2009). The Self-Talk Scale (STS; Brinthaupt et al., 2009) comprises four factors, social assessment, self-reinforcement, self-criticism, and self-management. The authors of the STS share a similar view with Vygotsky (1962), in that they believe that self-talk frequency is related to self-regulation. However, the authors also posit that self-talk frequency is a multidimensional construct that is better understood by examining the functions that it might serve to individuals, which is the underlying purpose of the STS. Since self-regulation is a known associate of behavioural enactment, the STS may be a particularly useful assessment for patients with COPD participating in PR.

When measuring self-statements using questionnaires or inventories, it is important to consider what exactly is being assessed. It is unlikely that people have the exact thoughts that are presented on a questionnaire due to the automaticity of thought processes and the fact that thoughts are based on imagery in addition to language (Glass & Arnkoff, 1982). Also, people are probably not aware of the exact frequency in which these thoughts occur (Glass & Arnkoff, 1997), and may not be aware of certain thoughts at all. Therefore inventories that include frequency scales may not actually be assessing frequency at all. It could be however, that these scales measure the impact, or salience of the thought to the individual, or alternatively the scales could measure the participants' self-concept or degree to which the presented thought is something participants associate with him or herself (Glass & Arnkoff, 1997). Although self-talk questionnaires may not provide an inventory of self-speech that is precisely the same as people's

actual self-speech, responses to the questionnaires tell us something meaningful about the individual (Glass & Arnkoff, 1997). Despite this, it is recognized that self-talk inventories will only measure self-statements that people are aware of.

A reoccurring theme in the literature is that an individuals' motivational interpretation of self-talk may provide the greatest indication of the meaning of self-talk statements to the individual. A self-talk questionnaire assessing the motivational interpretation of self-talk statements has yet to be developed. The valence dimension of self-talk has been commonly assessed; however, whether a statement is positive or negative can be inferred by the researcher, thus a questionnaire developed for this purpose is not needed. Including a frequency scale in the self-talk questionnaire would allow for self-talk to be classified as positive or negative, which could subsequently be assessed. Examining the frequency of self-talk may provide valuable insight into the types of self-talk statements that are most common, and whether self-talk frequency is related to the motivational interpretation of self-talk. To date, there is no questionnaire to assess exercise self-talk in PR patients. Production methods described by Glass and Arnkoff (1997) generate a rich sample of self-statements and will be useful in constructing a questionnaire. In addition, self-talk statements used in Sport Psychology may also be relevant to exercise self-talk.

Chapter 2: Pilot Study

Purpose

To date, an exercise self-talk measure has not been constructed. Research has indicated that self-talk frequency and motivational interpretation of self-talk statements are key assessment scales to consider. The purpose of this study was to develop an instrument to assess the frequency and motivational interpretation of exercise related self-talk statements. More specifically, the purpose of this study was to determine salient self-talk statements that PR patients say to themselves about exercise. The self-talk statements generated by participants were used to create a self-talk item pool. Final items for the questionnaire were selected based on their relevance.

Method

The Centre for Lung Health

The Centre for Lung Health (CFLH) provides an outpatient PR program, The Breathe Easy Program, for those diagnosed with chronic lung diseases designed to help patients manage their disease and symptoms. Patients were referred to the program by a physician, at which time a full pulmonary function test was performed. Upon enrollment, patients were given the option of attending classes three days per week for six weeks, or two days a week for eight weeks. They were also given the option of attending either morning, afternoon, or evening classes. Each class included supervised exercise for two hours and education classes for one hour. The exercise classes were supervised by respiratory therapists and followed the guideless for exercise training in PR (Ries

et al., 2007). Importantly, the classes were tailored to each individual's needs and capabilities. The exercise classes commenced with breathing and stretching exercises. After the warm-up, the exercise sessions included hallway walking, treadmill walking, cycling, arm ergometer training, therabands, and handheld weights, in no particular order. The education classes were offered every session by a multi-disciplinary team consisting of respiratory therapists, physical therapists, health psychologists, dieticians, kinesiologists, and pharmacists. The topics of the education classes included: the basic physiology of lung diseases, stress management and coping with lung diseases, respiratory medications (including proper use and techniques), nutrition, oxygen therapy, and travel/home care.

The CFLH provided equipment and supervision during designated hours to the graduates of The Breathe Easy Program for a small fee. The graduate exercise area included the same type of equipment that was used during PR, and included supplemental oxygen. There were no additional educational classes provided at this time, however those attending were encouraged to ask the staff questions regarding their exercise and disease.

Participants

Graduates of The Breathe Easy Program were recruited from the CFLH. Participants had a variety of lung diseases, from COPD, to Asthma, and Pulmonary Fibrosis. In addition, they had experience with exercise tasks, and equipment.

Interview

Formal semi-structured interviews were conducted lasting approximately 30 minutes. The interviews consisted of questions regarding participants' experiences with exercise throughout their life – including reasons why they exercise, type, amount, and duration of exercise, their current thoughts about exercise when performing exercise, and encountering barriers to exercise – including the nature and valence of their thoughts, how they respond to their thoughts about exercise – either verbally or in action, and how their thoughts might influence their exercise adherence. Participants were asked direct questions about their self-talk statements, and also situational questions. Asking people to acknowledge and understand the types of self-talk statements that they said to themselves was an introspective task which may have been particularly difficult when the context the statements arisen in were new, and when they had never thought about how they talked to themselves. Situational questions lessened the recollection burden of participants. In addition, there was a set of questions regarding medication usage and their associated thoughts with this task. Asking questions regarding medication usage provided some insight into thought processes when these individuals were trying to remember to do something. Medication adherence is quite different from exercise participation; however it provided a good starting point to understand the nature and phrasing of self-talk statements. The specific self-talk statements about exercise that participants generated were used to create an item pool that informed the creation of an exercise self-talk questionnaire. See Appendix A for a copy of the interview.

Procedures

An expert in qualitative methods reviewed the interview questions to ensure that the wording of the questions would not create response bias, and that the questions would generate detailed responses. A respiratory therapist then reviewed the interview to judge if the language and phrasing of the questions would be able to be understood by this population. Then, program staff helped to recruit potential participants to take part in the interview during participants' scheduled exercise time at the CFLH. A variety of experiences and responses was ideal, so program staff were asked to recruit participants who were diverse in their illness severity, the amount of time that they had been coming to the lung centre, the amount of time that they had been diagnosed, their age, gender, and social support (if known). The study was presented to potential participants as a study about their experiences and thoughts about exercise. Once participants agreed to participate, an information letter was given to them and informed consent was obtained, (Appendix B). Interviews were conducted with 10 individuals who had graduated from the respiratory program at the CFLH. The interviews were audio recorded to ensure accuracy.

Ethical considerations. This study was approved by the University of Alberta Research Ethics Board and Covenant Health before data collection begun. Participation was completely voluntary, and researchers ensured informed consent, privacy and confidentiality. Participants were assigned an identification number that was included on all data collection forms in place of their name. Any personally identifiable material was stored in a desktop within the researchers

locked office. In addition, questionnaires were kept in a locked cabinet that only the researcher had access to.

Analysis & Results

Generation of Item Pool

The self-talk statements articulated by the participants were transcribed verbatim. The self-statements identified by the participants in the interviews were used to develop a self-talk statement item pool organized in Microsoft Office Excel. Complex thoughts were broken down into single-subject thoughts and grammatical modifications were made where necessary. Items were screened and eliminated if they were redundant, synonymous, incomprehensible, and or irrelevant to exercise. Emerging categories were then developed from the item pool. The categories were mutually exclusive, exhaustive, and independent.

Of the 111 self-talk statements about exercise that were identified, 34 were duplicates or were redundant, for example, “I can’t do this” and “I don’t think I can do this”. Seven of the duplicates referred to exercise as being helpful, 8 duplicates referred to participants being able or unable to partake in exercise, 5 duplicates indicated that participants didn’t “feel like exercising”, and 4 duplicates were that participants were “too tired to exercise”. Three additional items were excluded because they were unrelated to exercise (e.g., “I hope I don’t have to clean off my car”). In total, 74 unique items were included in the item pool for analysis.

Themes

Two higher order themes were identified by one researcher: social-cognitive self-talk and non-social cognitive self-talk. From the social-cognitive self-talk theme the following categories were identified: self-efficacy (e.g., "I can do this"), perceived difficulty (e.g., "This is too hard"), perceived severity (e.g., "I can't breathe very well), outcome expectations (e.g., "I am going to be in good shape"), instrumental attitudes (e.g., "This is helping me"), affective attitudes (e.g., "This isn't so bad"), and barriers (e.g., "I don't feel like doing anything"). Some of the self-talk items seemed to overlap between outcome expectations and attitudes. For example, "If you don't want to go and exercise then you will get fat", could be both an outcome expectation and an instrumental attitude, as this statement points to both an anticipated outcome of exercise and also a beneficial attribute of exercise. From the non-social-cognitive self-talk theme the following categories were identified: persistence (e.g., "A little bit at a time"), personal physical evaluation (e.g., "I feel strong"), personal pressure (e.g., "You should do more"), and reassurance (e.g., "I'm going to be fine"). Some items under these sub-themes were not as precisely similar to each other, as in the social-cognitive sub-themes. For example, "I'm not as good as the others" indicates that a personal physical evaluation is being made, however, there seems to be a social comparison element to this statement as well. In addition, some reassurance items seem as though they may be related to self-efficacy. Further exploration of these items will ensue in subsequent testing of this questionnaire in order to determine which items are most related to each other. Operational definitions for each

category were developed that were deemed adequate by an additional researcher and are included in Appendix C. The self-talk statements were then coded to match the operational definition of the appropriate category.

Preliminary Construction of "The Exercise Self-talk Questionnaire"

Only self-talk statements that were found in the pilot study were used. Novel items were not created. For some self-talk categories, semantic opposites for the same self-talk category were found, which were deemed high/low or positive/negative. For example, high self-efficacy was represented by "I can do this", and low self-efficacy was represented by "I don't think I can do this". Not all categories had semantic opposites. So for some self-talk categories, such as instrumental attitude self-talk, there was only a high instrumental attitude statement, "Exercise is helping me". Since no low instrumental attitude self-talk statement was identified from the pilot study, no low instrumental attitude self-talk statement was used in the exercise self-talk questionnaire. That is, for categories without semantic opposites, no self-talk statements were created to fill this void.

To minimize participant burden, only 1 statement reflecting the social-cognitive self-talk categories was chosen. A single researcher chose the statement that best reflected the operational definition of each social-cognitive self-talk category. In total, there were 8 items representing social-cognitive constructs: one item each for high self-efficacy (i.e., "I can do this"), low self-efficacy ("I don't think I can do this"), high perceived difficulty (i.e., "This is too difficult"), low perceived difficulty ("This is easy"), high perceived severity (i.e., "I can't breathe

very well), positive instrumental attitudes (i.e., “This is helping me”), positive affective attitudes (i.e., “This isn’t so bad”), and high barriers (i.e., “I don’t feel like it). Conceptually, outcome expectations and attitudes overlap. An individual’s anticipated outcome is in part constructed from their attitudes towards the activity itself. Similarly, an individual’s attitude and outcome expectancy may be influenced by past outcomes. To date it seems that the attitude construct is much more precisely defined compared to the outcome expectation construct. Therefore, an outcome expectation item was not included in the self-talk questionnaire in order to ensure items could be easily differentiated from one another.

For the non-social-cognitive self-talk categories, only items that clearly matched the operational definition were chosen. In total there were 14 items representing non-social-cognitive self-talk categories, 4 items each for persistence and personal pressure, and 3 items each for personal physical evaluation and reassurance. The high persistence items included: “I’m going to do it even though I don’t feel like it”, “A little bit at a time”, and “Just do it”. The low persistence item was “I think I’ll stop trying”. The positive personal physical evaluation item was, “I feel strong”. The negative personal physical evaluation item was, “My body is not in good condition”, and “I’m not in very good shape”. The high personal pressure items were, “I should do more”, “I have to keep trying”, “I need to work harder”, and “You have to do it”. The reassurance items included, “I can make it”, “I’m going to be fine”, and “Just a little bit longer”.

For the Exercise Self-Talk Questionnaire, 22 items in total were retained. A frequency and a motivational interpretation scale were used to assess each self-talk item. The following question is presented to assess frequency, "How often do you say this statement to yourself about exercise?" Possible responses are presented on a scale from 1 (never) to 7 (very often). The following question is presented to assess motivational interpretation, "Does this statement make you want to exercise more or less?" Possible responses to this question range from 1 (much less) to 7 (much more), where 4 = neither more nor less. A 7-point scale was chosen over a 5-point scale to encourage variability in responses. Also, the assessment of social-cognitive constructs is often measured on 7-point scales, thus the same scale was chosen for measurement consistency. This questionnaire can be found in Appendix D.

Changes to Social-Cognitive Questionnaire

The literature review suggested that self-efficacy, instrumental attitudes, affective attitudes, and perceived severity would be the key social-cognitive constructs associated with exercise participation in people with COPD. Analysis of the interviews indicated that these four constructs were indeed present in participants' self-talk statements about exercise. The analysis also revealed that perceived difficulty and barriers are social-cognitive constructs that are relevant to self-talk about exercise. Therefore, items to assess perceived difficulty, and barriers were added to the social-cognitive questionnaire. In order to minimize participant burden, self-efficacy (task, coping, scheduling), perceived severity, perceived difficulty, and barriers will all be assessed by a single-item. Single-item

indicators are advantageous over multiple-item indicators when questionnaire length and monotony are a concern (Gardner & Cummings, 1998). The barriers item chosen reflected the most common self-talk statement derived from the interviews; that participants didn't "feel like exercising". It is of interest as to whether certain instrumental and affective attitudes are more pertinent to this population in this context; therefore, these constructs will be assessed by multiple items.

Chapter 3: Main Study

Purpose and Research Questions

The original research purpose was to examine self-talk in patients with COPD. To ensure timely data collection, all patients attending PR at the CFLH were included in this study.

To date, little research has been conducted on identifying the specific cognitive constructs represented in self-talk statements and whether self-talk is related to social-cognitive constructs and clinical indicators. This study explored the relationships for exercise self-talk, social-cognitive constructs, and clinical indicators of PR. Self-talk was assessed by two measures, the Self-talk Scale (STS; Brinthaupt et al., 2009), which is a general measure of the functions of self-talk in adults, and by an exercise-specific self-talk measure that includes a frequency and motivational interpretation scale that was constructed by the researcher based on pilot interviews. Due to participant burden only the most important social-cognitive constructs to this particular setting and population were assessed. Thus, intentions, exercise SE, perceived severity, barriers, perceived difficulty, instrumental and affective attitudes were assessed, with a primary interest in the relationships between self-talk, SE and perceived severity. Additionally, the relationship between perceived and actual severity were considered, and whether perceived or actual severity was more related to social-cognitive constructs, self-talk content, and clinical indicators of PR. The clinical indicators of PR that were assessed include functional exercise capacity (6MWT), and disease specific health status (SGRQ).

Research Questions

All research questions pertain to relationships between variables at the beginning of PR.

Primary Research Question. The purpose was to determine the degree of relationship between social-cognitive self-talk items (self-efficacy; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers) and corresponding social-cognitive items (self-efficacy: task, coping, scheduling; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers).

Secondary Research Question 1. The purpose was to determine the degree of relationship for non-social-cognitive self-talk items (personal physical evaluation, personal pressure, persistence, and reassurance) and social-cognitive constructs (self-efficacy: task, coping, scheduling; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers).

Secondary Research Question 2. The purpose was to determine the degree of relationship for social-cognitive constructs (self-efficacy: task, coping, scheduling; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers), and intentions to exercise in and out of PR.

Secondary Research Question 3. The purpose was to determine the degree of relationship for self-talk items (self-efficacy; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers; personal physical evaluation; personal pressure; persistence; and reassurance) and self-talk function (social assessment, self-criticism, self-reinforcement, self-management).

Secondary Research Question 4. The purpose was to determine the degree of relationship for social-cognitive constructs (self-efficacy: task, coping, scheduling; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers) and self-talk function (social assessment, self-criticism, self-reinforcement, self-management).

Secondary Research Question 5. The purpose was to determine the degree of relationship for self-talk items (self-efficacy; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers; personal physical evaluation; personal pressure; persistence; and reassurance) and PR clinical indicators (6MWT, SGRQ).

Secondary Research Question 6. The purpose was to determine the degree of relationship for social-cognitive constructs (self-efficacy: task, coping, scheduling; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers) and PR clinical indicators (6MWT, SGRQ).

Secondary Research Question 7. The purpose was to determine the degree of relationship for self-talk function (social assessment, self-criticism, self-reinforcement, self-management) and PR clinical indicators (6MWT, SGRQ).

Secondary Research Question 8. The purpose was to determine the degree of relationship for perceived illness severity (perceived severity, and MRC dyspnea scale) and actual illness severity measured by lung function – spirometry (FEV1 % predicted, FEV1/FVC).

Secondary Research Question 9. The purpose was to determine the degree of relationship for social-cognitive variables (all except perceived severity), MRC dyspnea scale, and lung function (FEV1 % predicted, FEV1/FVC).

Secondary Research Question 10. The purpose was to determine the degree of relationship for self-talk items (self-efficacy; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers; personal physical evaluation; personal pressure; persistence; and reassurance), MRC dyspnea scale, and lung function (FEV1 % predicted, FEV1/FVC).

Secondary Research Question 11. The purpose was to determine the degree of relationship between self-talk function, MRC dyspnea scale, and lung function (FEV1 % predicted, FEV1/FVC).

Secondary Research Question 12. The purpose was to determine the relationships between perceived severity (MRC dyspnea scale, perceived severity), actual severity measured by lung function (FEV1 % predicted, FEV1/FVC), and PR clinical indicators (6MWT, SGRQ).

Method

Participant Recruitment

Participants were recruited from The Breathe Easy Program at the CFLH. Respiratory disease diagnosis was confirmed by a full pulmonary function test. Patients were excluded if they had a recent respiratory exacerbation, had unstable cardiac disease, interstitial lung disease, Talc Granulomatosis, or were unable to follow instructions and answer questionnaires due to language barriers or cognitive deficits as determined by the CFLH staff from clinical chart data or

during interaction in the PR classes. Patients were included if they required supplemental oxygen, were current smokers, had co-morbidities including stable chronic heart failure and stable coronary artery disease. Participants were recruited in person during their first week of PR.

Measures

PR clinical indicators that are routinely collected by program staff at the beginning and end of rehabilitation were used. One of the clinical indicators is a disease specific measure of health status (SGRQ), and the other is a measure of functional exercise capacity (6MWT). In addition to these measures, participants were asked to complete three brief questionnaires. Two of the questionnaires were self-talk questionnaires. One was a general measure of self-talk function in adults, and the other was a measure of exercise-related self-talk developed in the pilot study. The final questionnaire was a composite measure assessing social-cognitive constructs: attitudes, SE, perceived severity, perceived difficulty, and barriers. In addition, demographic characteristics, and lung function was collected.

Demographics. Age, gender, self-reported smoking history in pack years, and marital status, was collected from the database at the CFLH.

The St. George's Respiratory Questionnaire (SGRQ; Jones, Quirk, & Baveystock, 1991). This instrument is a COPD specific assessment of health status that consists of 50 items. The items are organized into three content areas: symptoms (frequency and severity of COPD symptoms), activities (activities causing or are limited by breathlessness), and impacts (social functioning impairment and psychological disturbances resulting from airways disease). The

impact of the disease on overall health status is gaged by calculating a Total score. Scores are expressed as a percentage of overall impairment where 100 indicates the poorest possible health status and 0 indicates the best possible health status. This measure has been found to be a valid measure of health status in patients with COPD (P. W. Jones, Quirk, Baveystock, & Littlejohns, 1992). This questionnaire is available in Appendix E.

Functional Exercise Capacity. The 6MWT assessed functional exercise capacity. The mean distance (in metres) on three self-paced walks was taken. The 6MWT was conducted on a closed-course in the hallways of the CFLH. During the 6MWT, patients were encouraged to walk at their own pace in order to control breathlessness. The 6MWT is a continuous measure. Patient's typically walk between 300 and 400 metres in 6-minutes (Bentsen et al., 2010; Garrod et al., 2008). In patients with respiratory disease, the six-minute walk distance has been shown to correlate highly with the twelve-minute walk distance and the two-minute walk distance (r = 0.96 and 0.89, respectively) (Butland, Pang, Gross, Woodcock, & Geddes, 1982). Walk test distance has also been shown to correlate with lung function, health status, and maximal VO2 (Brown & Wise, 2007), and be predictive of mortality (Cote et al., 2008).

Lung Function. Spirometry was performed according to American Thoracic Society Criteria (ATS, 2005). Data from the spirometry tests were obtained from the database at the CFLH and is reported in absolute and percent predicted values. Spirometry tests the ability of the lungs to move air in and out of it and produces measurements of forced vital capacity (FVC), and forced

expiratory volume in one second (FEV1), which was used to calculate the FEV1/FVC ratio.

Medical Research Council (MRC) dyspnea scale. This 5-point scale assesses the degree of breathlessness, from 1, (not troubled by breathlessness except with strenuous exercise) to 5 (too breathless to leave the house or breathless when dressing or undressing). This scale is commonly used during the clinical assessment of people with COPD (O'Donnell et al., 2007) and has been found to be predictive of mortality in people with COPD (Nishimura et al., 2002). The MRC was collected from the database at the CFLH.

The Self-Talk Scale (STS; Brinthaupt, et al., 2009). Four self-regulatory functions of self-talk, social assessment, self-reinforcement, self-criticism, and self-management, were assessed by 4 items each (16 items total). Following the prompt, "I talk to myself when", participants were asked to rate how often on a 5-point likert scale that they engaged in self-talk, from 1 (never) to 5 (very often). The individual subscale scores were calculated by summing the four items associated with each facet. An example of a social assessment item was, "I'm imagining how other people respond to things I've said." An example of a self-reinforcement item was, "I'm proud of something I've done." An example of a self-criticism item was, "I should have done something differently." Lastly, and example of a self-management item was, "I'm giving myself instructions or directions about what I should do or say." See Appendix F for this questionnaire.

Exercise Self-Talk Questionnaire. As developed in the pilot study, 8 social-cognitive self-talk categories and 6 non-social-cognitive self-talk categories

were assessed on a frequency, and a motivational interpretation scale. For the frequency scale, participants were asked, "How often do you say this statement to yourself about exercise?" Possible range of responses were from 1 (never) to 7 (very often). For the motivational interpretation scale, participants were asked, "Does this statement make you want to exercise more or less?" Possible range of responses were from 1 (much less) to 7 (much more), with 4 indicating neither more or less. The 8 social-cognitive self-talk categories include, low SE, high SE, low perceived difficulty, high perceived difficulty, high barriers, high perceived severity, high instrumental attitudes, and high affective attitudes. One item was used to assess each category in order to minimize participant burden. The 6 non-social-cognitive self-talk categories include negative personal physical evaluation, positive personal physical evaluation, reassurance, high persistence, low persistence, and high personal pressure. Multiple items assessed each non-social cognitive items and an overall category score was assessed by summing the item scores and dividing by the number of items. This questionnaire has been presented in Appendix D.

Social Cognitive Construct Questionnaire. The following introduction was given: "The following questions ask about your thoughts regarding exercise. Exercise refers to at least 30 minutes of the things you do at the lung centre (e.g., walk on a treadmill, ride a bike, use therabands)." See Appendix G for this questionnaire.

Self-Efficacy for Exercise. The assessment of SE for exercise was adapted from the Multidimensional Self-Efficacy for Exercise Scale

(MSES; Rodgers, Wilson, Hall, Fraser, & Murray, 2008), which was found to be both reliable and valid by the authors. Task, coping, and scheduling SE for exercise were assessed by one item each (3 items total) on a 100% confidence scale, where 0% indicates no confidence and 100% indicates absolute confidence. Participants were asked to indicate their confidence for performing exercise tasks (e.g. confidence to perform all of the required movements), coping with barriers exercise (e.g. confidence for exercising when you feel discomfort), and scheduling time to exercise (e.g., confidence for arranging schedule to include regular exercise).

Perceived Severity. Perceived severity of COPD was assessed by one item on a 7-point likert scale from 1 (strongly agree) to 7 (strongly disagree). The item was, "My lung disease is severe…" A similar item and scale was used in a study about exercise beliefs and coronary heart disease (Mirotznik, Feldman, & Stein, 1995).

Attitudes for exercise. Attitudes for exercise was assessed on a 7-point likert scale from 1 (strongly agree) to 7 (strongly disagree). There were 4 adjectives that measured instrumental attitudes (helpful, unhelpful, beneficial, and harmful) and 4 adjectives that measured affective attitudes (enjoyable, un-enjoyable, fun and boring) following the prompt, "For me, exercising at least 2 or 3 days at the lung centre is…" The overall score wasthe mean for each item, with negative items (unhelpful, harmful, un-enjoyable, and boring) being reversed scored. Strong internal consistency has been found from similar scales investigating TPB constructs in

exercise contexts (Conner, Sandberg, & Norman, 2010; Norman & Conner, 2005b).

Perceived Difficulty. Perceived difficulty for exercise was assessed by one item on a 7-point likert scale from 1 (strongly agree) to 7 (strongly disagree). The item was, "For me, exercising at least 2 or 3 days a week is difficult."

Barriers for exercise. Barriers to exercise was assessed by a single item on a 7-point likert scale from 1 (strongly agree) to 7 (strongly disagree). The item was, "For me, exercising at least 2 or 3 days a week is not something I feel like doing."

Procedures

All data were collected at the CFLH at Edmonton General Hospital. The study was described to potential participants as a study interested in their experience and thoughts about exercise. Potential participants were given an information letter and filled out the consent form if they agreed to participate in the study (Appendix H). At the beginning of PR (during the first two weeks of PR) participants completed all questionnaires and the 6MWT. The SGRQ, demographic information, and the 6MWT are routinely collected by the program staff as these measurements are used by the CFLH as clinical indicators and for information purposes. Lung function tests were obtained by medical records or pre-program assessments.

Ethical considerations. The same ethical considerations were employed as the pilot study.

Analyses

The data were analysed by IBM SPSS Statistics 19.

Data Screening. Data was screened for scores that fell outside the possible range of responses by examining the range of scores, along with box-plots and histograms. All scores fell within their expected measurement scales.

Sample Description. Descriptive statistics were calculated for demographic and lung function data at baseline including means and standard deviations.

Research Questions. Pearson Product Moment Correlations were conducted for all variables as stipulated by the research questions.

Assumptions. Normality, linearity, and homoscedasticity assumptions were assessed in continuous variables used in the correlation analyses by examining histograms and scatterplots. Assumptions were not violated.

Power considerations. Power considerations were based on the primary research question. For 80% power, assuming a moderate effect size and an alpha of .05, 85 participants are required (Cohen, 1992). Assuming a large effect size and an alpha of .05, 28 participants would be needed to achieve 80% power.

Chapter 4: Results

Patients were recruited from The Centre for Lung Health between July and September 2012. Out of 116 potential participants, 83 agreed to participate (72% recruitment rate). Four were removed from the analyses due to cognitive impairment, and one due to an English language barrier as determined by program staffs' examination of patient charts or by their face to face interaction during PR classes. Analyses are on 78 (37 female, 41 male) respiratory patients beginning PR.

Participant Characteristics

The average age of male patients was 71 years old (*SD* = 9.70, min = 52, max = 95 years), and the average age of female patients was 68 years old (*SD* = 9.42, min = 48, max = 88 years). There were 74 patients that were Caucasian, 1 North American Native, 1 Asian, and 2 unknown. Patients primary diagnosis was predominantly COPD (n = 58, 74%), followed by pulmonary fibrosis (n = 7, 9%), asthma (n = 4, 5%), interstitial lung disease (n = 2, 3%), and several other diseases represented once, including, asbestosis, bronchiectasis, lung cancer, and pulmonary embolism. Patients smoked on average for 38 pack years (min = 0, max = 115 pack years).

Missing Data

Less than 5% of data from the study variables were missing. Due to this small amount, the missing data were replaced by the mean of scores corresponding to the participants' gender and age (± 5 years). This procedure is acceptable when less than 5% of total data is missing (Tabachnik & Fidell, 2007).

Study Measurements

Descriptive statistics for all study variables are presented by gender. Means and standard deviations for clinical indicators and variables, including the SGRQ, functional exercise capacity, lung function, and the MRC dyspnea scale are presented in Table 1. The SGRQ and MRC dyspnea scores from patients in this sample are similar to the average of COPD patients scores in a recent review conducted, although their functional exercise capacity on average is greater than the COPD patients in the review (Lacasse et al., 2006). Means and standard deviations for self-talk questionnaires are presented in Table 2. Means and standard deviations for social-cognitive variables are presented in Table 3.

Table 1

Means and standard deviations for clinical indicators and variables by gender

	Female		Male	
	M	*SD*	*M*	*SD*
SGRQ, %				
Symptoms	54.44	22.85	54.53	20.22
Activity	65.83	18.12	66.23	20.91
Impacts	29.51	16.05	33.67	19.38
Total Score	44.74	15.06	47.07	17.47
6MWT, m	437.84	96.41	346.38	118.42
Lung Function				
FEV1, L	1.23	0.63	1.89	0.67
FEV1, % predicted	63.25	26.72	59.66	20.03
FEV1/FVC ratio	0.55	0.17	0.56	0.17
MRC Dyspnea Scale	2.89	0.96	2.98	0.91

Note. SGRQ = St. George's Respiratory Questionnaire, 6MWT = six-minute walk test, FEV1 = forced expiratory volume in 1 second, FVC = forced vital capacity, MRC = Medical Research Council, *M* = mean, *SD* = standard deviation, m = metres, L = litres.

Table 2

Means and standard deviations for self-talk variables by gender

	Female		Male	
	M	*SD*	*M*	*SD*
Self-talk function (STS), (1-5)				
Self-criticism	2.93	0.81	2.91	0.96
Self-reinforcement	3.36	0.86	3.31	0.84
Self-management	3.23	0.82	3.20	0.84
Social assessment	2.78	0.84	2.86	0.95
Social-cognitive self-talk, (1-7)				
High SE STF	4.59	1.76	4.46	1.60
High SE STMI	5.30	1.10	4.80	1.08
Low SE STF	2.95	1.37	3.34	1.54
Low SE STMI	4.68	1.23	4.39	1.24
High PD STF	3.46	1.57	3.41	1.80
High PD STMI	4.73	1.45	4.65	1.06
Low PD STF	3.41	1.67	3.37	1.62
Low PD STMI	4.76	1.16	4.59	1.05
High PS STF	4.32	1.44	4.98	1.64
High PS STMI	4.65	1.27	4.88	1.31
High IA STF	5.03	1.26	5.05	1.30
High IA STMI	5.24	0.98	5.27	0.95
High AA STF	4.27	1.81	4.12	1.90
High AA STMI	5.03	1.19	4.73	0.98
High Barrier STF	4.03	1.36	4.20	1.45
High Barrier STMI	4.43	0.99	4.29	1.21
Non-social-cognitive self-talk, (1-7)				
Negative PPE STF	4.35	1.36	5.01	1.52
Negative PPE STMI	4.91	1.12	5.09	1.01
Positive PPE STF	3.54	1.59	3.41	1.34
Positive PPE STMI	4.76	1.36	4.78	1.11
Reassurance STF	4.56	1.23	4.59	1.15
Reassurance STMI	5.04	0.95	4.93	0.90
High Persistence STF	4.15	1.12	4.53	1.17
High Persistence STMI	4.84	0.93	4.96	0.89
Low Persistence STF	2.30	1.37	2.34	1.32
Low Persistence STMI	4.43	1.41	4.71	1.27
High PP STF	4.64	1.04	4.91	1.33
High PP STMI	4.88	0.94	5.06	0.86

Note. SE = self-efficacy, PD = perceived difficulty, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, PPE = personal physical evaluation, PP = personal pressure, STF = self-talk frequency, STMI = self-talk motivational interpretation, *M* = mean, *SD* = standard deviation.

Table 3

Means and standard deviations for social-cognitive constructs by gender

	Female		Male	
	M	*SD*	*M*	*SD*
Intentions in-PR, (1-5)	4.16	0.83	4.05	0.87
Intentions out-PR, (1-5)	4.08	1.09	3.76	1.32
Self-efficacy, (0-100)				
Task	85.06	13.31	76.10	24.35
Coping	69.64	26.19	72.03	24.69
Scheduling	67.95	22.23	66.53	26.58
Perceived severity, (1-7)	4.18	1.76	4.90	2.04
Perceived difficulty, (1-7)	2.62	1.67	3.71	2.07
Barriers, (1-7)	3.05	1.76	3.27	1.90
Instrumental attitude, (1-7)	6.24	0.79	6.04	1.29
Affective attitude, (1-7)	5.64	1.10	4.73	1.70

Note. PR = pulmonary rehabilitation, *M* = mean, *SD* = standard deviation.

Gender Comparisons

One-Way ANOVAs compared genders on demographic characteristics. There was a statistically significant difference between genders on smoking history in pack years, $F(1, 67) = 5.81$, $p = .02$, with male participants ($M_{years} = 46$) smoking longer than female participants ($M_{years} = 33$). Male and female participants did not differ by ethnic origin, primary diagnosis, or age, *p*'s between .17 and .86.

One-Way ANOVAs compared genders on clinical indicators. There were statistically significant differences between male and female participants on FEV1, $F(1, 74)$ 16.21, $p = .000$, and the 6MWT, $F(1, 76) = 13.81$, $p = .000$. Male participants had greater FEV1 ($M_{litres} = 1.89$) compared to female participants ($M_{litres} = 1.29$). Female participants walked further on the 6MWT ($M_{metres} = 438$) compared to male participants ($M_{metres} = 346$). Male and female participants did not differ on the SGRQ subscales or total score, *p*'s between .28 and .96, FEV1 % predicted, $p = .51$, FEV1/FVC, $p = .70$, or MRC dyspnea scale, $p = .68$.

One-Way ANOVAs compared male and female participants on self-talk function and found that the genders did not differ on any of the self-talk function variables, self-criticism, self-reinforcement, self-management, or social assessment, *p*'s between .20 and .94.

One-Way ANOVAs compared male and female participants on social-cognitive self-talk variables. There was a statistically significant difference between the genders on the high SE motivational interpretation self-talk item, $F(1, 76) = 3.98$, $p = .05$, with female participants rating this item higher (M =

5.30) than male participants (M = 4.80). There were no differences between genders on any of the other variables, high SE self-talk frequency, low SE self-talk frequency or motivational interpretation, high/low perceived difficulty self-talk frequency or motivational interpretation, high perceived severity self-talk frequency or motivational interpretation, high instrumental attitudes self-talk frequency or motivational interpretation, high affective attitudes self-talk frequency or motivational interpretation, high barrier self-talk frequency or motivational interpretation, p's between .19 and .99.

One-Way ANOVAs compared male and female participants on non-social-cognitive self-talk items. There was a statistically significant difference between genders on the frequency of negative personal physical evaluation self-talk, $F(1, 76) = 4.06$, $p = .05$, with male participants (M = 5.01) having more frequent negative personal physical evaluation self-talk than female participants (M = 4.35). All other comparisons by gender were non-significant including negative personal physical evaluation self-talk motivational interpretation, positive physical evaluation self-talk frequency and motivational interpretation, reassurance self-talk frequency and motivational interpretation, high/low persistence self-talk frequency and motivational interpretation, and high personal pressure self-talk frequency and motivational interpretation, p's between .21 and .94.

One-Way ANOVAs compared the genders on social-cognitive constructs. Male and female participants had different task SE for exercise, $F(1, 76) = 3.95$, $p = .05$, and perceived difficulty for exercise $F(1, 76) = 6.43$, p = .013. Female

participants (*M* = 85.06) had higher task SE than male participants (*M* = 76.10). Female participants (*M* = 2.62) perceived exercise to be less difficult than male participants (*M* = 3.71). There were no other statistically significant differences between genders on any of the other social-cognitive variables, coping and scheduling SE for exercise, perceived severity, perceived barriers, instrumental attitudes, or affective attitudes, *p*'s between .11 and .80.

There were differences between genders on functional exercise capacity, some self-talk items, and some social-cognitive items. It was of interest as to whether the relationships between the variables differed by gender as well. Therefore, for the main analyses, correlations between variables were conducted both with genders separated and combined.

Research Questions

Primary Research Question. The purpose was to determine the degree of relationship for social-cognitive self-talk items (high self-efficacy, low self-efficacy, high perceived difficulty, low perceived difficulty, high perceived severity, high barriers, high instrumental attitudes, and high affective attitudes) and corresponding social-cognitive items (self-efficacy: task, coping, scheduling; perceived difficulty, perceived severity, barriers, instrumental attitudes, and affective attitudes).

In total there are 8 social-cognitive self-talk items: high self-efficacy (SE), low SE, high perceived difficulty (PD), low PD, high perceived severity (PS), high barrier, high instrumental attitude (IA), high affective attitude (AA). Pearson product moment correlation coefficients were conducted between self-talk

variables and their corresponding social-cognitive self-talk counterparts, along with intentions to exercise in and out of PR. Separate tables were constructed for each social-cognitive self-talk variable set, and the corresponding social-cognitive variable(s). SE correlations are presented in Table 4, PD presented in Table 5, PS in Table 6, barrier in Table 7, IA in Table 8, and AA in Table 9.

Table 4

Bivariate correlations for intention, multidimensional self-efficacy and high and low self-efficacy self-talk items collapsed across and separated by gender

	Intention in-PR	Intention out-PR	Task SE	Coping SE	Scheduling SE	High SE STF	High SE STMI	Low SE STF	Low SE STMI
Intention in-PR	–	.20†	.22†	.06	.14	.17	.12	.08	-.02
Intention out-PR	.13/ .23	–	.31**	.24*	.21	.03	.31**	-.07	.21
Task SE	.09/ .27	.14/ .36*	–	.46**	.45**	.06	.15	-.21†	.17
Coping SE	.10/ .03	.13/ .35*	.56**/ .48**	–	.48**	.05	.13	-.01	.06
Scheduling SE	.27/ .04	.36*/ .12	.35*/ .51**	.66**/ .35*	–	.16	.31**	-.26*	.22†
High SE STF	.32†/ .04	.09/ -.03	-.09 / .14	**.24/ -.15**	.30/ .05	–	.57**	-.03	.19†
High SE STMI	.10/ .12	.35*/ .25	-.12/ .23	.17/ .12	.34*/ .28†	.67**/ .48**	–	-.05	.43**
Low SE STF	.06/ .12	-.15/ .01	-.11/ -.23	.02/ -.04	**.06/ -.47****	.01/ -.07	-.03/ -.02	–	-.37**
Low SE STMI	-.14/ .08	.19/ .21	**-.17/ .32***	**-.17/ .29**†	.09/ .32*	.11/ .26	.46**/ .38*	-.44**/ -.29†	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. PR = pulmonary rehabilitation, SE = self-efficacy, STF = self-talk frequency, STMI = self-talk motivational interpretation, †$p < .10$, *$p < .05$, ** $p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 5

Bivariate correlations for intention, perceived difficulty and high and low perceived difficulty self-talk items collapsed across and separated by gender

	Intention in-PR	Intention out-PR	PD	High PD STF	High PD STMI	Low PD STF	Low PD STMI
Intention in-PR	–	.20†	.08	.20†	.00	-.05	.09
Intention out-PR	.14/ .23	–	-.04	-.07	.18	.12	.19†
PD	.01/ .18	-.07/ .05	–	.36**	-.12	-.29*	-.22*
High PD STF	.05/ .31*	-.17/ -.01	.41*/ .37*	–	-.16	-.14	-.08
High PD STMI	-.10/ .08	.22/ .14	-.23/ -.02	-.05/ -.25	–	.17	.45**
Low PD STF	.09/ -.17	**.33*/ -.05**	-.36*/ -.25	-.02/ -.24	.07/ .26†	–	.42**
Low PD STMI	.19/ -.01	.15/ .21	-.13/ -.28†	.00/ -.16	.45**/ .45**	.49**/ .34*	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. PR = pulmonary rehabilitation, PD = perceived difficulty, STF = self-talk frequency, STMI = self-talk motivational interpretation, †$p < .10$, *$p < .05$, ** $p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 6

Bivariate correlations for intention, perceived severity, and high perceived severity self-talk items collapsed across and separated by gender

	Intention in-PR	Intention out-PR	PS	High PS STF	High PS STMI
Intention in-PR	–	.20†	.01	.08	-.18
Intention out-PR	.14/ .23	–	-.14	-.07	.09
PS	-.10/ .12	-.14/ -.10	–	-.03	.01
High PS STF	.21/ .00	.02/ -.08	-.19/ .01	–	-.06
High PS STMI	-.13/ -.22	**.38*/ -.09**	.02/ -.03	-.13/ -.05	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. PR = pulmonary rehabilitation, PS = perceived severity, STF = self-talk frequency, STMI = self-talk motivational interpretation, *p = < .05, **bold** = correlations are statistically different, $p < .05$.

Table 7

Bivariate correlations for intention, barriers and high barrier self-talk items collapsed across and separated by gender

	Intention in-PR	Intention out-PR	Barriers	High barrier STF	High barrier STMI
Intention in-PR	–	.20†	-.07	.14	.00
Intention out-PR	.14/ .23	–	-.20†	-.17	-.06
Barriers	-.14/ -.01	-.15/ -.22	–	.46**	-.14
High barrier STF	.29†/ .03	-.08/ -.22	.31†/ .58**	–	-.14
High barrier STMI	.01/ -.01	.02/ -.13	-.19/ -.11	-.30†/ -.03	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. PR = pulmonary rehabilitation, STF = self-talk frequency, STMI = self-talk motivational interpretation, †$p < .10$, ** $p < .01$.

Table 8

Bivariate correlations for intentions, instrumental attitudes and high instrumental attitudes self-talk items collapsed across and separated by gender

	Intention in-PR	Intention out-PR	IA	High IA STF	High IA STMI
Intention in-PR	–	.20†	-.01	.15	.00
Intention out-PR	.14/ .23	–	-.02	.08	.22†
IA	**-.34*/ .16**	-.24/ .06	–	.15	.18
High IA STF	.26/ .06	.08/ .08	.13/ .18	–	.49**
High IA STMI	.05/ -.05	.14/ .29	**.42*/ .06**	.38*/ .60**	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. PR = pulmonary rehabilitation, IA = instrumental attitudes, STF = self-talk frequency, STMI = self-talk motivational interpretation, †$p < .10$, *$p < .05$, ** $p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 9

Bivariate correlations for intention, affective attitudes and high affective attitudes self-talk items collapsed across and separated by gender

	Intention in-PR	Intention out-PR	AA	High AA STF	High AA STMI
Intention in-PR	–	.20†	-.02	.06	.06
Intention out-PR	.14/ .23	–	.19†	-.12	.17
AA	-.09/ -.01	.30†/ .10	–	.09	.15
High AA STF	.25/ -.10	-.10/ -.15	.10/ .07	–	.44**
High AA STMI	.14/ -.04	.19/ .12	**.36*/ -.05**	.57**/ .32*	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. PR = pulmonary rehabilitation, AA = affective attitudes, STF = self-talk frequency, STMI = self-talk motivational interpretation, †$p < .10$, *$p < .05$, ** $p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 1. The purpose was to determine the degree of relationship for non-social-cognitive self-talk items to negative personal physical evaluation, positive personal physical evaluation, reassurance, high persistence, low persistence, and high personal pressure, and social-cognitive constructs (intentions in and out of PR, self-efficacy: task, coping, scheduling; perceived difficulty, barriers, perceived severity; instrumental attitudes, and affective attitudes).

There are six non-social-cognitive self-talk categories: negative personal physical evaluation (PPE), positive PPE, reassurance, high persistence, low persistence, high personal pressure (PP). Pearson product moment correlation coefficients were conducted between self-talk variables and all of the social-cognitive constructs, including intentions to exercise in and out of PR, and are displayed collapsed across gender in Table 10, and separated by gender in Table 11. Inter-factor correlations for the non-social-cognitive self-talk categories are displayed collapsed and separated by gender in Table 12.

Table 10

Bivariate correlations for social-cognitive constructs and non-social-cognitive self-talk items collapsed across gender

	Intentions in-PR	Intentions out-PR	Task SE	Coping SE	Scheduling SE	PD	Barriers	PS	IA	AA
Negative PPE STF	.23*	-.04	-.17	-.02	-.21†	.36**	.24*	.15	-.20†	-.37**
Negative PPE STMI	.17	.14	.03	.03	.24*	-.10	-.19†	.16	.04	.17
Positive PPE STF	.11	.19	.27*	.11	.26*	-.49**	-.48**	-.18	.02	.19†
Positive PPE STMI	.05	.21†	.11	.11	.34**	-.20†	-.22†	.13	.00	.15
Reassurance STF	.20†	.10	.04	.14	.19†	-.01	-.05	.05	-.15	.00
Reassurance STMI	.16	.20†	.14	.09	.36**	-.21†	-.21†	.10	.01	.23*
High persistence STF	.27*	-.03	-.10	.02	.03	.10	.06	.06	-.30**	-.18
High persistence STMI	.05	.09	-.06	-.01	.20†	-.16	-.16	.22†	-.03	.19†
Low persistence STF	.04	-.25	-.11	-.08	-.24*	.26*	.27*	.05	-.37**	-.27*
Low persistence STMI	.11	.12	.00	.08	.13	-.24*	-.25*	.04	.04	.36**
High PP STF	.30**	.02	.02	.06	.10	.01	.03	.07	-.18	-.16
High PP STMI	.07	.06	-.03	.03	.32**	-.24*	-.21	.10	.04	.16

Note. PR = pulmonary rehabilitation, SE = self-efficacy, PD = perceived difficulty, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, STF = self-talk frequency, STMI = self-talk motivational interpretation, PPE = personal physical evaluation, PP = personal pressure, $^{\dagger}p < .10$, $*p < .05$, $** p < .01$.

Table 11

Bivariate correlations for social-cognitive constructs and non-social-cognitive self-talk items separated by gender (F/M)

	Intention in-PR	Intention out-PR	Task SE	Coping SE	Scheduling SE	PD	Barriers	PS	IA	AA
Negative PPE STF	.30†/ .21	-.06/ .02	-.09/ -.14	.14/ -.18	**.13/ -.43****	.34*/ 31*	.15/ .29†	.04/ .17	-.04/ -.26†	-.40*/ -.30†
Negative PPE STMI	.24/ .12	.32†/ .03	-.12/ .15	-.03/ .09	.22/ .26†	-.30†/ .01	-.27/ -.14	.13/ .17	-.04/ -.26†	-.40*/ -.30†
Positive PPE STF	.27/ -.06	.12/ .24	**-.10/ .51****	.00/ .23	**-.10/ .50****	-.45**/ -.55**	-.49**/ -.48**	-.12/ -.18	-.04/ .05	-.40*/ -.30†
Positive PPE STMI	.09/ .01	.37/ .08	.00/ .19	.05/ .18	.34*/ .35*	-.22/ -.20	-.33*/ -.10	.25/ .01	.15/ -.10	**.46**/ -.05**
Reassurance STF	**.40*/ .03**	-.06/ .23	-.18/ .16	.16/ .11	.20/ .18	.04/ -.05	-.07/ -.04	.00/ .09	-.10/ -.20	.05/ -.02
Reassurance STMI	.17/ .13	.21/ .17	**-.13/ .27**†	.08/ .10	.27/ .43**	-.25/ -.16	-.19/ -.22	.13/ .10	.17/ -.08	.42**/ .10
High persistence STF	.46**/ .14	-.08/ .04	**-.40*/ .08**	.14/ -.10	.23/ -.10	.14/ .01	.05/ .05	.08/ -.01	-.33*/ -.28†	-.12/ -.15
High persistence STMI	.14/ -.03	.13/ .08	**-.34*/ .10**	-.14/ .12	.17/ .23	-.23/ -.16	-.14/ -.19	.21/ .20	.04/ -.06	.33*/ .16
Low persistence STF	-.04/ .12	-.39/ -.14	-.23/ -.06	-.04/ -.11	-.10/ -.36*	.37*/ .19	.21/ .31*	.22/ -.10	-.44**/ -.35*	-.36*/ -.25
Low persistence STMI	.18/ .06	.12/ .15	-.18/ .14	**-.24/ .28**†	.10/ .17	**-.47**/ -.13**	-.34*/ -.20	-.16/ .18	-.04/ .11	.35*/ .48**
High PP STF	.41*/ .25	-.01/ .06	**-.28†/ .17**	.12/ .01	.17/ .06	.20/ -.14	.10/ -.03	.05/ .05	-.01/ -.24	-.17/ -.11
High PP STMI	.14/ .00	.22/ -.05	**-.25/ .12**	-.12/ .18	.19/ .44**	-.30†/ -.28†	-.21/ -.22	.07/ .10	.23/ -.05	.31†/ .14

Note. PR = pulmonary rehabilitation, SE = self-efficacy, PD = perceived difficulty, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, STF = self-talk frequency, STMI = self-talk motivational interpretation, PPE = personal physical evaluation, PP = personal pressure, †$p < .10$, *$p < .05$, ** $p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 12

Bivariate correlations for non-social-cognitive self-talk items collapsed across and separated by gender

	Negative PPE STF	Negative PPE	Positive PPE	Positive PPE	Reassur. STF	Reassur. STMI	High persist. STF	High persist. STMI	Low persist. STF	Low persist. STMI	High PP STF	High PP STMI
Negative PPE STF	–	.33*	-.37**	.00	.37**	.17	.50**	.19	.28*	.03	.47**	.19
Negative PPE	.27/ .37*	–	.02	.53**	.44**	.75**	.41**	.78**	-.30**	.52**	.49**	.82**
Positive PPE	**-.14/ -.59****	.19/ -.17	–	.30**	.30**	.21†	.12	.06	-.11	.05	.10	.12
Positive PPE	.04/ -.04	.63**/ .41**	.36*/ .21	–	.31**	.71**	.23*	.65**	-.33**	.31**	.31**	.66**
Reassur. STF	.50**/ .27†	.37*/ .52**	.40*/ .18	.29†/ .34*	–	.59**	.73**	.45**	.04	.23†	.74**	.42**
Reassur. STMI	.28†/ .12	.84**/ .68**	.25/ .16	.64**/ .81**	.57**/ .62**	–	.44**	.81**	-.27*	.50**	.54**	.80**
High persist. STF	.44**/ .52**	.35*/ .45**	**.32†/ -.06**	.21/ .27†	.82**/ .66**	.44**/ .48**	–	.48**	.29**	.31**	.81**	.39**
High persist. STMI	.18/ .18	.79**/ .77**	.10/ .01	.60**/ .72**	.34*/ .57**	.82**/ .82**	.43**/ .52**	–	-.19	.57**	.53**	.88**
Low persist. STF	.23/ .32*	-.36*/ -.24	-.15/ .07	-.47**/ -.17	-.04/ .11	-.37*/ -.18	.14/ .43**	-.22/ -.16	–	-.22†	.14	-.30**
Low persist. STMI	.08/ -.06	.56**/ .46**	.17/ -.07	.23/ .42**	.19/ .28†	.48**/ .55**	.26/ .32*	.51**/ .64**	-.27/ -.18	–	.24*	.60**
High PP STF	.55**/ .41**	.50**/ .48**	.14/ .09	.28†/ .35*	.67**/ .82**	.53**/ .58**	.77**/ .83**	.50**/ .55**	-.01/ .25	.19/ .27†	–	.56**
High PP STMI	.28†/ .08	.91**/ .73**	.12/ .13	.58**/ .75**	.31†/ .54**	.81**/ .82**	.37*/ .39*	.86**/ .90**	-.34*/ -.27†	.66**/ .53**	.59**/ .54**	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. STF = self-talk frequency, STMI = self-talk motivational interpretation, PPE = personal physical evaluation, Reassur. = reassurance, persist. = persistence, PP = personal pressure, †$p < .10$, *$p < .05$, ** $p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 2. The purpose was to determine the degree of relationship for social-cognitive constructs (intentions in and out of PR, self-efficacy: task, coping, scheduling; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers), and intentions to exercise in and out of PR.

Table 13 displays the correlations for social-cognitive constructs and intentions to exercise collapsed across and separated by gender.

Table 13

Bivariate correlations social-cognitive constructs displayed collapsed across and separated by gender

	Intention in-PR	Intention out-PR	Task SE	Coping SE	Scheduling SE	PD	Barriers	PS	IA	AA
Intention in-PR	–	.20†	.22†	.06	.14	.08	-.07	.01	-.01	-.02
Intention out-PR	.14/ .23	–	.31**	.24*	.21†	-.04	-.20†	-.14	-.02	.19†
Task SE	.09/ .27†	.14/ .36*	–	.46**	.45**	-.26*	-.30**	-.13	.03	.19†
Coping SE	.10/ .03	.13/ .35*	.56**/ .48**	–	.48**	.00	-.04	.05	-.06	.01
Scheduling SE	.27/ .04	.36*/ .12	.35*/ .51**	**.66**/ .35****	–	-.21†	-.21†	-.06	.10	.22†
PD	.01/ .18	-.07/ .05	-.06/ -.27†	**.20/ -.18**	**.06/ -.37***	–	.62**	.21†	-.12	-.37**
Barriers	-.14/ -.01	-.15/ -.22	-.20/ -.35*	**.19/ -.25**	**.10/ -.43****	.61**/ .64**	–	.17	-.26*	-.47**
PS	-.09/ .12	-.14/ -.10	-.06/ -.11	.08/ .00	**.22/ -.24**	.21/ .14	.28†/ .08	–	.16	.08
IA	**-.34*/ .16**	-.24/ .06	.11/ -.03	-.19/ .02	-.35*/ .30†	-.12/ -.09	-.06/ -.36*	.05/ .25	–	.40**
AA	-.09/ -.01	.30†/ .10	.03/ .17	-.14/ .13	.08/ .30†	-.52**/ -.21	-.57**/ -.44**	-.03/ .24	.21/ .46**	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. PR = pulmonary rehabilitation, SE = self-efficacy, PD = perceived difficulty, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, †$p < .10$, *$p < .05$, ** $p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 3. The purpose was to determine the degree of relationship for self-talk items (high self-efficacy, low self-efficacy, high perceived difficulty, low perceived difficulty, high perceived severity, high barrier, high instrumental attitudes, high affective attitudes, negative personal physical evaluation, positive personal physical evaluation, reassurance, high persistence, low persistence, and high personal pressure) and self-talk function (self-criticism, self-reinforcement, self-management, and social assessment).

Summary of correlations for the social-cognitive self-talk items and self-talk function categories are displayed collapsed across and separated by gender in Table 14. Correlations for non-social-cognitive self-talk items and self-talk function are displayed collapsed across and separated by gender in Table 15. Inter-factor correlations for self-talk function are displayed in Table 16.

Table 14

Bivariate correlations for social-cognitive self-talk items and self-talk functions collapsed across and separated by gender

	Self-criticism ST		Self-reinforcement ST		Self-management ST		Social assessment ST	
	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M
High SE STF	.11	**.37*/ -.12**	.23*	.35*/ .10	.20†	.29†/ .12	.31**	.39*/ .25
High SE STMI	.20†	.38*/ .07	.22*	.32†/ .09	.15	.07/ .22	.09	.18/ .04
Low SE STF	.23*	.39*/ .12	.00	.14/ -.07	.18	.31†/ .10	.10	.28†/ -.04
Low SE STMI	-.14	-.15/ -.13	.11	.09/ .10	-.16	-.19/ -.14	-.04	-.09/ .01
High PD STF	.25*	**.47**/ .10**	.13	**.38*/ -.07**	.30**	**.53**/ .13**	.27*	.43**/ .16
High PD STMI	-.09	-.15/ -.04	.10	.02/ .17	.05	-.08/ .16	-.01	-.11/ .09
Low PD STF	-.06	.11/ -.19	.11	.20/ .03	-.14	.03/ -.29†	.08	.12/ .06
Low PD STMI	.13	.22/ .05	.26*	.19/ .30†	-.04	.06/ -.13	.06	.15/ -.02
High PS STF	.26*	**.54**/ .08**	-.07	**.19/ -.22**	.22†	**.46**/ .05**	.25*	.42**/ .12
High PS STMI	-.11	-.17/ -.06	.19†	.03/ .37*	-.01	-.12/ .09	.11	-.05/ .22
High Barrier STF	.26*	.28†/ .26	.00	.16/ -.12	.33**	.37*/ .30†	.26*	.31†/ .22
High Barrier STMI	-.18	-.08/ -.24	.21†	.22/ .19	-.03	.09/ -.11	.11	.10/ .12
High IA STF	.11	.03/ .17	.02	-.17/ .18	.13	.02/ .22	.09	-.03/ .18
High IA STMI	.29*	.25/ .31*	.20†	**.00/ .40****	.16	.02/ .29†	.13	.19/ .07
High AA STF	.08	.01/ .13	.10	.16/ .04	.12	.22/ .04	.19	.14/ .23
High AA STMI	.01	.03/ -.01	.18	.14/ .18	-.01	.00/ -.02	.08	.08/ .10

Note. F = female participants, M = male participants, ST = self-talk, STF = self-talk frequency, STMI = self-talk motivational interpretation, SE = self-efficacy, PD = perceived severity, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, ptp = participants, †$p < .10$, *$p < .05$, **$p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 15

Bivariate correlations for non-social-cognitive self-talk items and self-talk functions collapsed across and separated by gender

	Self-criticism ST		Self-reinforcement ST		Self-management ST		Social assessment ST	
	All ptps	F/ M	All Ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Negative PPE STF	.31**	.40*/ .26	.30	.15/ .00	.35**	.44**/ .30†	.26*	.41*/ .14
Negative PPE STMI	-.01	-.03/ .01	.10	-.01/ .24	.05	-.05/ .14	.08	-.06/ .19
Positive PPE STF	.09	.13/ .06	.25*	.34*/ .14	.03	.05/ .00	.09	.16/ .03
Positive PPE STMI	.19†	.18/ .21	.16	.25/ .06	.01	-.04/ .06	.13	.17/ .10
Reassurance STF	.29*	**.50**/ .11**	.26*	**.48**/ .05**	.39**	.53**/ .27†	.31**	**.49**/ .15**
Reassurance STMI	.07	.14/ .01	.18	.19/ .16	.09	.04/ .12	.09	.02/ .16
High persistence STF	.29**	.41*/ .22	.30**	**.62**/ .07**	.40**	**.58**/ .27†**	.47**	.53**/ .42**
High persistence STMI	.05	.01/ .09	.18	.15/ .24	.05	.05/ .06	.11	-.01/ .20
Low persistence STF	.14	.19/ .10	.06	.20/ -.07	.17	.30†/ .05	.21†	.15/ .26
Low persistence STMI	-.19†	-.28†/ -.11	.06	.10/ .05	-.05	.00/ -.10	.02	-.09/ .11
High PP STF	.28*	.29†/ .28†	.20	**.42**/ .07**	.44**	.55**/ .37*	.40**	.50**/ .33*
High PP STMI	.03	-.08/ .12	.17	.07/ .31*	.05	.02/ .08	.07	.02/ .11

Note. F = female participants, M = male participants, ST = self-talk, STF = self-talk frequency, STMI = self-talk motivational interpretation, PPE = personal physical evaluation, PP = personal pressure, ptp = participants, †$p < .10$, *$p < .05$, **$p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 16

Bivariate correlations for self-talk functions collapsed across and separated by gender

	Self-criticism ST	Self-reinforcement ST	Self-management ST	Social assessment ST
Self-criticism ST	–	.34**	.64**	.57**
Self-reinforcement ST	.46**/ .26	–	.52**	.47**
Self-management ST	.56**/ .71**	.60**/ .46**	–	.72**
Social assessment ST	.67**/ .50**	.63**/ .36*	.81**/ .65**	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. ST = self-talk, *$p < .05$, **$p < .01$.

Secondary Research Question 4. The purpose was to determine the degree of relationship for social-cognitive constructs (intentions in and out of PR, self-efficacy: task, coping, scheduling; perceived difficulty, barriers, perceived severity, instrumental attitudes, and affective attitudes) and self-talk function (social assessment, self-criticism, self-reinforcement, self-management).

Summary of the correlations for social-cognitive constructs and self-talk function are displayed collapsed across and separated by gender in Table 17.

Table 17

Bivariate correlations for social-cognitive constructs and self-talk functions displayed collapsed across and separated by gender

	Self-criticism ST		Self-reinforcement ST		Self-management ST		Social assessment ST	
	All ptps	F/ M	All Ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Intentions in-PR	.07	.11/ .04	.01	.15/ -.14	.21†	.37*/ .06	.07	**.28†/ -.09**
Intentions out-PR	-.06	-.06/ -.07	-.04	-.05/ -.07	-.06	-.15/ .01	-.15	-.04/ -.21
Task SE	.10	.12/ .10	-.02	-.18/ -.01	.07	.04/ .08	.15	.16/ .18
Coping SE	.22*	.39*/ .09	.16	.31†/ .04	.14	.32†/ -.02	.09	**.45**/ -.22**
Scheduling SE	.00	**.26/ -.16**	.26*	.33*/ .21	.05	.26/ -.10	.12	**.38*/ -.06**
PD	.13	.33*/ .01	-.08	.15/ -.19	.05	.17/ -.02	.09	.25/ -.04
Barriers	.04	.00/ .07	-.13	**.07/ -.29†**	.06	.06/ .06	.10	.11/ .09
PS	.05	-.05/ .11	.07	.09/ .11	.10	-.10/ .26	.04	-.04/ .08
IA	-.14	-.09/ -.17	-.04	**-.45**/ .16**	-.19	-.41*/ -.08	-.24*	-.23/ -.25
AA	-.11	-.08/ -.14	.06	-.05/ .05	-.24*	-.31†/ -.24	-.16	-.32†/ -.08

Note. F = female participants, M = male participants, ST = self-talk, PR = pulmonary rehabilitation, PR = pulmonary rehabilitation, SE = self-efficacy, PD = perceived difficulty, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, ptp = participants, †$p < .10$, *$p < .05$, **$p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 5. The purpose was to determine the degree of relationship for self-talk items (high self-efficacy, low self-efficacy, high perceived difficulty, low perceived difficulty, high perceived severity, high barrier, high instrumental attitudes, and high affective attitudes; negative personal physical evaluation, positive personal physical evaluation, reassurance, high persistence, low persistence, and high personal pressure) and PR clinical indicators (6MWT, SGRQ).

Correlations for social-cognitive self-talk items and PR clinical indicators are displayed collapsed across and separated by gender in Table 18. Correlations for non-social cognitive self-talk items and PR clinical indicators are displayed collapsed across and separated by gender in Table 19.

Table 18

Bivariate correlations for social-cognitive self-talk items and PR clinical indicators collapsed across and separated by gender

			SGRQ							
	6MWT (m)		Symptoms		Activity		Impacts		Total	
	All ptps	F/ M	All ptps	F/ M	All Ptps	F/ M	All ptps	F/ M	All ptps	F/ M
High SE STF	.06	.13/ -.03	.23*	.20/ .27†	-.03	-.01/ -.05	.10	.12/ .10	.10	.11/ .09
High SE STMI	.06	-.05/ -.01	.14	.11/ .17	.13	.12/ .15	.11	.07/ .19	.14	.11/ .20
Low SE STF	-.15	-.14/ -.19	.11	.10/ .13	.26*	.14/ .35*	.25*	.23/ .24	.25*	.19/ .29†
Low SE STMI	.00	**-.29†/ .12**	.03	-.12/ .16	-.05	.04/ -.10	-.01	-.17/ .12	.00	-.07/ .07
High PD STF	-.16	-.32†/ -.09	.06	.05/ .07	.27*	.20/ .32*	.27*	.36*/ .23	.26*	.26/ .26
High PD STMI	.00	-.10/ .05	-.11	-.17/ -.05	-.10	-.14/ -.07	-.05	**-.29†/ .14**	-.09	-.25/ .05
Low PD STF	.31**	.15/ .47**	-.13	-.03/ -.23	-.32**	-.26/ -.38*	-.26*	**-.04/ -.42****	-.29*	-.11/ -.42**
Low PD STMI	.13*	.05/ .15	.01	-.10/ .13	-.02	-.03/ -.01	.09	.12/ .09	.04	.02/ .07
High PS STF	-.21†	**.13/ -.32***	.19†	**-.11/ .47****	.32*	.17/ .42**	.45**	.41*/ .46**	.39**	.21/ .51**
High PS STMI	.04	-.05/ .19	-.07	-.21/ .06	-.07	-.10/ -.06	-.17*	**-.39*/ -.03**	-.15	-.32†/ -.03
High Barrier STF	-.23†	**.00/ -.37***	.14	-.03/ .29†	.22†	.22/ .23	.28*	.21/ .32*	.25*	.15/ .33*
High Barrier STMI	-.02	-.08/ -.03	.12	**-.24/ .42****	-.00	-.06/ .04	.12	-.17/ .30†	.09	**-.19/ .27†**
High IA STF	.17	.15/ .22	-.03	-.05/ -.01	-.16	-.14/ -.17	-.06	-.06/ -.06	-.10	-.11/ -.10
High IA STMI	.09	.04/ .16	.09	.08/ .11	.08	.15/ .02	.12	.25/ .03	.10	.18/ .05
High AA STF	.20†	.18/ .22	.11	.09/ .14	-.05	-.10/ -.02	.05	.09/ .03	.03	.01/ .04
High AA STMI	.12	.10/ .05	.14	**-.06/ .39***	-.09	.03/ .15	.14	.07/ .26	.13	-.01/ .28†

Note. PR = pulmonary rehabilitation, 6MWT = six minute walk test, m = metres, SGRQ = St. George's Respiratory Questionnaire, F = female participants, M = male participants, STF = self-talk frequency, STMI = self-talk motivational interpretation, SE = self-efficacy, PD = perceived severity, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, ptp = participants, $^{\dagger}p < .10$, $*p < .05$, $**p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 19

Bivariate correlations for non-social-cognitive self-talk items and PR clinical indicators collapsed across and separated by gender

			SGRQ							
	6MWT (distance)		Symptoms		Activity		Impacts		Total	
	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Negative PPE STF	-.35**	-.16/ -.39*	.40**	.25/ .56**	.44**	**.23/ .58****	.53**	.40*/ .60**	.52**	**.31/ .67****
Negative PPE STMI	-.02	-.02/ .04	.04	**-.18/ .28**†**	.10	.08/ .12	.04	-.15/ .18	.06	-.13/ .20
Positive PPE STF	.36**	**.11/ .61****	-.27*	-.05/ -.54	-.36**	-.28†/ -.44**	-.38**	-.25/ -.51**	-.40**	-.24/ -.56**
Positive PPE STMI	-.02	-.13/ .09	.10	.08/ .13	.10	.15/ .05	.13	.02/ .23	.12	.07/ .18
Reassurance STF	.19†	.13/ .28†	.03	.14/ -.10	.02	-.01/ .05	.13	.22/ .07	.09*	.14/ .04
Reassurance STMI	.09	.07/ .06	.04	-.06/ .14	.01	-.02/ .04	.08	-.06/ .20	.05	-.07/ .16
High persistence STF	-.07	-.09/ .05	.16	.14/ .19	.11	.08/ .14	.21†	.11/ .25	.19†	.11/ .23
High persistence STMI	-.07	-.13/ .02	.10	-.07/ .27†	.04	-.04/ .10	.06	**-.18/ .22**	.06	**-.14/ .22**
Low persistence STF	-.18	-.34*/ -.07	.07	.12/ .02	.10	.14/ .07	.10	.15/ .06	.12	.19/ .06
Low persistence STMI	.03	.15/ .03	.10	**-.10/ .29**†**	-.14	-.11/ -.17	-.01	**-.33**†/ .21**	-.05	**-.27**†/ .12**
High PP STF	.03	.05/ .10	.00	.04/ -.02	-.03	-.02/ -.03	.14	.18/ .10	.06	.08/ .04
High PP STMI	.03	.06/ .08	-.01	-.15/ .13	.00	-.03/ .01	-.01	-.16/ .09	-.03	-.17/ .08

Note. PR = pulmonary rehabilitation, 6MWT = six minute walk test, m = metres, SGRQ = St. George's Respiratory Questionnaire, F = female participants, M = male participants ST = self-talk, STF = self-talk frequency, STMI = self-talk motivational interpretation, PPE = personal physical evaluation, PP= personal pressure, ptp = participants, $^{\dagger}p < .10$, $*p < .05$, $**p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 6. The purpose was to determine the degree of relationship for social-cognitive constructs (intentions in and out of PR, self-efficacy: task, coping, scheduling; perceived severity; instrumental attitudes, affective attitudes, perceived difficulty, and barriers) and PR clinical indicators (6MWT, SGRQ).

Summary of correlations for social-cognitive constructs and PR clinical indicators are presented collapsed across and separated by gender in Table 20.

Table 20

Bivariate correlations for social-cognitive constructs and PR clinical indicators collapsed across and separated by gender

			SGRQ							
	6MWT (m)		Symptoms		Activity		Impacts		Total	
	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Intentions in-PR	-.05	.05/ -.18	-.03	-.06/ .01	-.01	.06/ -.06	.08	.10/ .08	.02	.03/ .03
Intentions out-PR	.09	.02/ .05	.03	.08/ -.01	-.01	.01/ -.01	-.08	-.11/ -.04	-.05	-.06/ -.03
Task SE	.39**	.19/ .41**	-.03	.02/ -.06	-.15	**.19/ -.30**†	-.05	**.33*/ -.17**	-.09	**.26/ -.22**
Coping SE	-.01	-.09/ .09	.03	.11/ -.05	.02	**.35*/ -.24**	.09	**.36*/ -.12**	.07	**.36*/ -.17**
Scheduling SE	.24*	**-.16/ .49****	-.07	**.21/ -.30**†	-.15	**.40*/ -.51****	-.15	**.38*/ -.47****	-.16	**.40*/ -.51****
PD	-.38**	-.31/ -.30	.18	.28†/ .12	.42**	.38*/ .47**	.36**	.47*/ .27†	.40**	.47**/ .35**
Barriers	-.25*	-.30/ -.22	.11	.06/ .15	.34**	.19/ .43**	.28*	.18/ .33*	.31**	.20/ .38*
PS	-.42**	-.51**/ -.30	.23*	.22/ .26	.34**	.33†/ .36*	.33**	.20/ .39*	.37**	.30†/ .40*
IA	.19†	.37**/ .07	-.11	-.10/ -.12	-.17	-.10/ -.20	-.08	.10/ -.14	-.13	-.02/ -.18
AA	.27*	.25/ .13	.01	-.11/ .08	-.24*	-.16/ -.29†	-.21†	-.21/ -.18	-.20†	-.20/ -.19

Note. 6MWT = six minute walk test, m = metres, SGRQ = St. George's Respiratory Questionnaire, F = female participants, M = male participants, PR = pulmonary rehabilitation, SE = self-efficacy, PD = perceived severity, PS = perceived severity, IA = instrumental attitudes, AA = affective attitudes, ptp = participants, $^{\dagger}p < .10$, $*p < .05$, $**p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 7. The purpose was to determine the degree of relationship for self-talk function (social assessment, self-criticism, self-reinforcement, self-management) and PR clinical indicators (6MWT, SGRQ)

Correlations for self-talk function and PR clinical indicators are presented collapsed across and separated by gender in Table 21.

Table 21

Bivariate correlations for self-talk functions and PR clinical indicators collapsed across and separated by gender

			SGRQ							
	6MWT (m)		Symptoms		Activity		Impacts		Total	
	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Self-criticism	-.02	-.11/ .03	.14	.18/ .12	.21†	.34*/ .13	.33**	.46**/ .26†	.30**	.42**/ .22
Self-reinforcement	.05	-.13/ .08	.07	.01/ .13	.03	.09/ -.02	-.02	.10/ -.07	.02	.09/ -.02
Self-management	-.01	.03/ -.06	.08	.09/ .06	.06	.14/ .01	.25*	.31†/ .21	.18	.24/ .14
Social assessment	.05	-.03/ .14	.16	.19/ .14	.05	**.30†/ -.12**	.23*	**.46**/ .07**	.19†	**.41*/ .03**

Note. PR = pulmonary rehabilitation, SGRQ = St. George's Respiratory Questionnaire, 6MWT = six minute walk test, m = meters, F = female participants, M = male participants, ptp = participants, $^{\dagger}p < .10$, $*p < .05$, $**p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 8. The purpose was to determine the degree of relationship for perceived illness severity (perceived severity, and MRC dyspnea scale) and actual illness severity measured by lung function – spirometry (FEV1 % predicted, FEV1/FVC).

Correlations for perceived severity and lung function are presented collapsed across and separated by gender in Table 22.

Table 22

Bivariate correlations for perceived illness severity and lung function collapsed across and separated by gender

	FEV1 % predicted		FEV1/FVC	
	All ptps	F/ M	All ptps	F/ M
PS	-.38**	**-.58**/ -.19**	-.19	**-.45**/ -.01**
MRC	-.21†	-.30†/ -.09	.08	**-.29†/ .12**

Note. PS = perceived severity, MRC = Medical Research Council dyspnea scale, FEV1 = forced expiratory volume in 1 second, FVC = forced vital capacity, ptps = participants, F = female participants, M = male participants, †$p < .10$, *$p < .05$, **$p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 9. The purpose was to determine the degree of relationship for social-cognitive variables (all except perceived severity), MRC dyspnea scale, and lung function (FEV1 % predicted, FEV1/FVC).

Correlations for social-cognitive variables, MRC dyspnea scale and lung function are presented collapsed across and separated by gender in Table 23.

Table 23

Bivariate correlations for social cognitive constructs, MRC dyspnea scale, and lung function collapsed across and separated by gender

	MRC		FEV1 % predicted		FEV1/FVC	
	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Intentions in-PR	-.11	.03/ -.22	.01	.18/ -.19	.07	.17/ -.01
Intentions out-PR	.03	.04/ .04	-.10	.00/ -.23	-.09	.10/ -.22
Task SE	-.24*	-.04/ -.34*	.07	-.02/ .12	.00	-.13/ .08
Coping SE	-.11	.03/ -.23	-.07	-.02/ -.12	-.11	-.06/ -.17
Scheduling SE	-.15	**.26/ -.46****	-.14	-.23/ -.06	-.05	-.07/ -.04
PD	.25*	.30†/ .21	-.14	-.01/ -.25	-.07	-.09/ -.10
Barriers	.25*	.13/ .35*	-.01	-.06/ -.07	.10	.15/ .06
IA	-.17	-.24/ -.13	-.09	-.09/ -.12	-.10	-.23/ -.03
AA	-.09	-.02/ -.12	-.08	-.21/ -.03	-.08	-.11/ -.04

Note. MRC = Medical Research Council dyspnea scale, FEV1 = forced expiratory volume in 1 second, FVC = forced vital capacity, ptps = participants, F = female participants, M = male participants, PR = pulmonary rehabilitation, SE = self-efficacy, PD = perceived difficulty, IA = instrumental attitudes, AA = affective attitudes, †$p <$ .10, *$p < .05$, **$p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 10. The purpose was to determine the degree of relationship for self-talk items (high self-efficacy, low self-efficacy, high perceived difficulty, low perceived difficulty, high perceived severity, high barriers, high instrumental attitudes, high affective attitudes; negative personal physical evaluation, positive personal physical evaluation, reassurance, high persistence, low persistence, and high personal pressure), MRC dyspnea scale, and lung function (FEV1% predicted, FEV1/FVC).

Correlations for social-cognitive self-talk items, MRC dyspnea scale and lung function are presented collapsed across and separated by gender in Table 24. Correlations for non-social cognitive items, MRC dyspnea scale, and lung function are presented collapsed across and separated by gender in Table 25.

Table 24

Bivariate correlations for social cognitive self-talk items, MRC dyspnea scale, and lung function collapsed across and separated by gender

	MRC		FEV1 % predicted		FEV1/FVC	
	All ptps	F/ M	All Ptps	F/ M	All ptps	F/ M
High SE STF	-.04	-.09/ .03	-.06	-.01/ .13	-.04	.02/ -.11
High SE STMI	-.05	-.05/ -.03	-.26*	-.20/ -.39*	-.18	-.11/ -.24
Low SE STF	.07	.12/ .02	-.06	.06/ -.17	-.07	.08/ -.20
Low SE STMI	-.02	.09/ -.10	-.15	-.29†/ -.02	-.06	-.28†/ .12
High PD STF	.18	.28†/ .10	-.00	.12/ -.13	-.01	.08/ -.08
High PD STMI	-.05	-.01/ -.09	-.15	-.13/ -.20	-.09	-.01/ -.16
Low PD STF	-.27*	-.33/ -.21	.19	.09/ .31†	.06	.10/ .01
Low PD STMI	-.13	-.03/ -.21	-.17	-.22/ -.12	-.15	-.28†/ -.02
High PS STF	.33**	**.13/ .47****	-.18	**.02/ -.39***	-.23†	-.21/ -.26
High PS STMI	-.08	-.01/ -.15	-.06	-.16/ .07	.01	-.05/ .05
High Barrier STF	.14	**-.06/ .31***	.06	**.30†/ -.21**	.12	**.35*/ -.08**
High Barrier STMI	-.06	-.02/ -.08	.00	-.15/ .14	.01	**-.20/ .18**
High IA STF	-.28*	-.20/ -.36*	-.11	-.04/ -.20	-.03	**.17/ -.20**
High IA STMI	-.13	-.07/ -.20	-.18	-.13/ -.25	-.19†	-.19/ -.20
High AA STF	-.09	.04/ -.19	.00	.13/ -.16	-.14	-.03/ -.24
High AA STMI	-.04	.03/ -.09	-.19	-.22/ -.19	-.09	-.17/ .01

Note. MRC = Medical Research Council dyspnea scale, FEV1 = forced expiratory volume in 1 second, FVC = forced vital capacity, ptps = participants, F = female participants, M = male participants, STF = self-talk frequency, STMI = self-talk motivational interpretation, SE = self-efficacy, PD = perceived difficulty, IA = instrumental attitudes, AA = affective attitudes, †$p < .10$, *$p < .05$, **$p < .01$, **bold** = correlations are statistically different, $p < .05$.

Table 25

Bivariate correlations for non-social cognitive self-talk items, MRC dyspnea scale, and lung function collapsed across and separated by gender

	MRC		FEV1 % predicted		FEV1/FVC	
	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Negative PPE STF	.15	.06/ .21	-.09	**.22/ -.41***	-.11	**.11/ -.30**†
Negative PPE STMI	-.05	.02/ -.12	-.08	-.03/ -.12	.03	.04/ .00
Positive PPE STF	-.27*	-.11/ -.44**	.12	**-.03/ .34***	-.02	-.10/ .07
Positive PPE STMI	-.06	-.03/ -.11	-.34**	-.42*/ -.22	-.23	-.37*/ -.07
Reassurance STF	-.25*	-.23/ -.27†	-.10	-.01/ -.21	-.07	.09/ -.23
Reassurance STMI	-.14	-.12/ -.15	-.17	-.12/ -.25	-.06	-.04/ -.08
High persistence STF	-.06	-.10/ -.05	-.04	-.05/ -.01	.04	.07/ -.01
High persistence STMI	-.04	.05/ -.14	-.17	-.18/ -.15	-.04	-.11/ .03
Low Persistence STF	.19	.29†/ .09	.13	.25/ -.02	.06	.17/ -.05
Low Persistence STMI	.01	.12/ -.09	-.06	-.09/ -.02	.08	.06/ .09
High PP STF	-.16	-.05/ -.25	-.06	.00/ -.11	-.06	-.06/ -.06
High PP STMI	-.10	.05/ -.25	-.12	-.09/ -.14	-.02	-.06/ .01

Note. MRC = Medical Research Council dyspnea scale, FEV1 = forced expiratory volume in 1 second, FVC = forced vital capacity, ptps = participants, F = female participants, M = male participants, STF = self-talk frequency, STMI = self-talk motivational interpretation, PPE = personal physical evaluation, PP = personal pressure, $^{\dagger}p < .10$, $*p < .05$, $**p < .01$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 11. The purpose was to determine the degree of relationship for self-talk function (self-criticism, self-reinforcement, self-management, and social assessment), MRC dyspnea scale and lung function (FEV1 % predicted, FEV1/FVC).

Correlations for self-talk function, MRC dyspnea scale, and lung function are displayed collapsed across and separated by gender in Table 26.

Table 26

Bivariate correlations for self-talk function, MRC dyspnea scale, and lung function collapsed across and separated by gender

	MRC		FEV1 % predicted		FEV1/FVC	
	All ptps	F/ M	All ptps	F/ M	All ptps	F/ M
Self-criticism	-.13	-.11/ -.14	-.13	-.04/ -.22	-.22	-.10/ -.32*
Self-reinforcement	-.02	.10/ -.12	-.09	**-.25/ .09**	-.15	-.26/ -.04
Self-management	-.04	-.12/ .04	-.05	-.02/ -.15	-.20	-.09/ -.29†
Social-assessment	-.06	-.18/ .04	.11	-.01/ .25*****	.01	-.19/ .16

Note. MRC = Medical Research Council dyspnea scale, FEV1 = forced expiratory volume in 1 second, FVC = forced vital capacity, ptps = participants, F = female participants, M = male participants, †$p < .10$, *$p < .05$, **bold** = correlations are statistically different, $p < .05$.

Secondary Research Question 12. The purpose was to determine the relationship for perceived severity (MRC dyspnea scale, perceived severity), actual severity measured by lung function (FEV1 % predicted, FEV1/FVC), and PR clinical indicators (6MWT, SGRQ).

Correlations for perceived severity, lung function, and PR clinical indicators are displayed collapsed across and separated by gender in Table 27.

Table 27

Bivariate correlations for perceived illness severity, lung function, and PR clinical indicators collapsed cross and separated by gender

	MRC	PS	FEV1 %	FEV1 /FVC	6MWT (m)	SGRQ total	SGRQ symptoms	SGRQ activity	SGRQ impacts
MRC	–	.18	-.21	-.08	-.50**	.29*	.23†	.33**	.22†
PS	.26/ .12	–	-.38**	-.19	-.42**	.37**	.23*	.34**	.33**
FEV1 %	-.30†/ -.09	**-.58**/ -.19**	–	.74**	.30**	-.24*	-.20	-.17	-.23†
FEV1/ FVC	**-.39*/ .12**	**-.45**/ -.01**	.79**/ .71**	–	.05	-.16	-.16	-.13	-.08
6MWT (m)	-.51**/ -.54**	-.51**/ -.30	.26/ .35*	.18/ .01	–	-.43**	-.29**	-.43**	-.36**
SGRQ total	.18/ .38*	.30/ .40**	-.09/ -.39*	-.20/ -.14	-.35*/ -.50**	–	.74**	.83**	.94**
SGRQ symptoms	.11/ .35*	.22/ .26	-.12/ -.32*	-.15/ -.16	-.24/ -.41**	.72**/ .77**	–	.47**	.61**
SGRQ activity	.24/ .40**	.33*/ .36*	-.06/ -.30†	-.13/ -.10	-.50**/ -.45**	.84**/ .83**	.47**/ .49**	–	.65**
SGRQ impacts	.11/ .30†	.20/ .39*	-.07/ -.39*	-.20/ -.12	-.16/ -.44**	.93**/ .95**	.54**/ .69**	.64**/ .65**	–

Note. Bivariate correlations for all participants (n = 78) are presented above the diagonal, and bivariate correlations for female/male participants (n = 37/41) are presented below the diagonal. MRC = Medical Research Council dyspnea scale, PS = perceived severity, FEV1 % = percent predicted forced expiratory volume in 1 second, FVC = forced vital capacity, SGRQ = St. George's Respiratory Questionnaire, 6MWT = six minute walk test, m = meters, †$p < .10$, *$p < .05$, **$p < .01$, **bold** = correlations are statistically different, $p < .05$.

Chapter 5: Discussion

The purpose of this research was to determine the relationships among self-talk frequency, motivational interpretation and function, social-cognitive constructs, and PR clinical indicators. Differences between genders on all study variables were also examined. Female PR patients had greater functional exercise capacity, greater confidence for performing elemental aspects of exercise tasks, and perceived exercise to be less difficult than male PR patients. Overall, male and female PR patients had similar frequency, motivational interpretation, and functions of self-talk. Only two significant differences were found between genders on the self-talk variables: females perceived high SE self-talk to be more motivational, and males reported more frequent negative personal physical evaluation self-talk. Although there were few differences between genders on the self-talk variables, some of the relationships for the self-talk variables, social-cognitive constructs, and PR clinical indicators varied by gender. This suggests that different approaches to self-talk interventions may need to be taken in male and female PR patients, as self-talk may serve different functions to male and female PR patients, and specific statements may be more meaningful to male and female PR patients.

Gender differences

Females comprise a significant portion of patients with respiratory disorders, including COPD. However, females are dramatically under-represented in COPD research (Lacasse et al., 1996; Marciniuk et al., 2010). The relatively equal number of male and female PR patients in this study allowed for gender

comparisons to be made. Similar to a review by Marciniuk et al. (2010), the results suggest that there are gender differences in disease manifestation. In this study, male and females had similar health status; females had less smoking exposure, greater functional exercise capacity than males, and better FEV1 percent predicted. Another study also found that females had higher FEV1 and functional exercise capacity, but found no differences between genders on health status (Haave, Skumlien, & Hyland, 2008). Another study that matched males and females on FEV1 found that females had less smoking exposure, worse quality of life, high dyspnea scores and more COPD exacerbations (de Torres et al., 2005). It appears that females with less smoking exposure may be more likely to develop COPD, and that the relationship between gender, disease severity, and quality of life is not clear. Unlike previous studies, the current study did not include exclusively COPD patients. Therefore, no firm conclusions on disease manifestation can be drawn in the current study, although it may be important to consider when interpreting the rest of the results.

Statistically significant gender differences were found for high SE self-talk motivational interpretation, and negative personal physical evaluation self-talk frequency. Females found high SE self-talk to be more motivational than males, and males more frequently said negative personal physical evaluation self-talk statements to themselves than females. Since males also had lower functional exercise capacity than females, it may be that males are aware of their lack of ability and poor physical condition, which might lead to more frequent negative statements about their physical bodies. In fact research has indicated that males

over 50 make comparisons of their current physical abilities to their physical abilities in their youth and if a discrepancy is perceived they may refrain from participating in exercise (Cousins & Burgess, 1992). The results of our research, combined with the results of Cousins and Burgess' research suggests that physical ability perceptions discrepant with self-concepts formed in their youth may be salient to older male adults, which may ultimately impact their behaviour. It is important to consider however, that the differences between males and females on these self-talk variables were small (i.e., less than 1 point on a 7 point likert scale), leading to question whether these differences are meaningful. A number of one-way ANOVAs were conducted without a bonferroni correction, which may also indicate that these differences are actually a statistical artifact. As this is the first study conducted using the exercise self-talk scale, the scale sensitivity is unknown. Results should be interpreted with caution.

Female PR patients had greater task SE than male PR patients. Given that females had greater functional exercise capacity than males, it seems that PR patients' perception of their abilities is in line with their objectively assessed physical abilities. Self-efficacy impacts the goals that people set and the challenges that they will take on, such that people with strong SE will set challenging goals and be persistent at pursuing, whereas people with weak SE will set simple goals and be easily derailed from their course of action (Bandura, 1997). In fact, previous research has indicated that task SE is an important predictor of behaviour in exercise initiates (Blanchard et al., 2002; Millen & Bray, 2008; Rodgers et al., 2002; 2009), although this relationship has not yet been

established in PR patients. The results of this study suggest that the male PR patients may be at risk of behavioural non-adherence. Task SE may be an important cognition for understanding exercise-related behaviour in PR patients, and warrants further investigation in future research.

Primary Research Question

The primary research question was to determine the degree of relationship for social-cognitive self-talk categories and corresponding social-cognitive constructs.

Consistency of Self-Talk and Social-Cognitions. Overall, participants' self-talk was consistent with their social-cognitive orientation. For example, participants who had high perceived barriers to exercise frequently engaged in barrier self-talk. The consistency of the self-talk categories to their corresponding social cognition speaks to the convergent validity of the self-talk statements and suggests that the self-talk statements chosen reflect the social-cognition they were supposed to. This finding supports Meichenbaum's (1977) depiction of self-talk as a technique for understanding cognitive content, and is consistent with social-cognitive theories. The consistency of self-talk and cognition suggests that cognitions can be conscious, and that they are in line with people's underlying belief systems; two tenets of social-cognitive theories (Conner & Norman, 2005). To some degree, PR patients are aware of their self-talk and their cognitions. This finding is promising, as awareness is the first step in bringing about changes in self-talk (Meichenbaum, 1977).

Some of the relationships for social-cognitive self-talk items and corresponding cognitions were stronger than others. Self-efficacy, perceived difficulty, and barrier self-talk frequency and to some degree motivational interpretation had stronger relationships to their respective cognitions than perceived severity self-talk frequency and motivational interpretation, and instrumental and affective attitudes self-talk frequency. Perceived severity self-talk frequency and motivational interpretation was the least related self-talk category to its corresponding social-cognition. The perceived severity self-talk statement was "I can't breathe very well", and the perceived severity construct item was, "My lung disease is severe". It may be that the perceived severity self-talk item chosen does not fully represent the social-cognitive construct. This self-talk item may capture part of perceived severity; however there may be other attributes of perceived severity that are not captured by this self-talk statement, such as coughing, wheezing, or pain. It is also possible that patients do not have a good understanding of their disease severity and the symptoms that contribute to their disease severity. It would be interesting to determine if this changes over PR when PR patients have attended more education classes. Or it may be that perceived severity is not well represented by self-talk in general. The lack of association between the motivational interpretation of perceived severity self-talk and the perceived severity construct may indicate that negative self-talk statements about one's disease symptoms may not be relevant to male or female PR patients' perception of their disease severity.

Gender Differences for Self-Talk and Corresponding Social-Cognition. The most variation between genders was found in the correlations for SE self-talk scales and multidimensional SE for exercise. In fact, for some of the correlations, the pattern of relationships for the SE self-talk scales (frequency and motivational interpretation) and multidimensional SE were opposite in male and female participants. In females, SE self-talk is consistent with their social cognitive orientation in both high SE (I can) and low SE (I can't) self-talk statement scales. In males, however, low SE (I can't) motivational interpretation was found to be positively related to task, coping, and scheduling SE for exercise. Research has indicated that older male and female adults approach their leisure time from different perspectives, which arise from different past experiences (Byles et al., 2013; Cousins & Burgess, 1992; Kluge 2002). Whereas males focus on their lack of ability and compare their current performance to their performance in their youth (Cousins & Burgess, 1992), females focus on what they are able to do currently because of the free time that arises from retirement and children growing up (Byles et al., 2013; Kluge, 2002). The differing perspectives among male and female older adults may lead to different salient motivational interpretations.

Male PR patients that have high confidence for exercise may purposefully engage in negative statements because they find them motivating. This could be a form of self-handicapping – males set low expectations so that they can avoid any damage to their self-esteem if they fail (Kolditz & Arkin, 1982). In fact, research has demonstrated that self-handicapping is driven by people's uncertainty in their

ability (Jones & Berglas, 1978), and in males over 50 years old, uncertainty of physical abilities is a salient perception that can influence exercise behaviour (Cousins & Burgess, 1992). Male PR patients may be confident that they 'can' exercise, but telling themselves that they 'can't' takes the pressure off of themselves in case they have an unsuccessful exercise experience. Then when they have a successful exercise experience it reinforces to themselves that they can exercise and builds their confidence. Unlike older male adults, uncertainty in one's abilities does not drive exercise participation in older female adults (Cousins & Burgess, 1992). Rather, older female adults' exercise participation can be influenced by the appearance of their body and past encouragement or discouragement from exercise and sport (Cousins & Burgess, 1992). It may be that perceptions of physical abilities are not a salient factor for exercise cognitions and participation in female PR patients. Subsequently, female PR patients may not engage in self-handicapping because they are certain in their abilities, or their perception of their ability is just not relevant to them.

There was some disconnect between instrumental and affective attitudes self-talk and the corresponding social-cognitions in male PR patients. In female patients, instrumental and affective attitudes were related to their motivational interpretation of self-talk statements, but not in male patients. Male patients found the negatively phrased SE item to be more motivational (i.e., "I can't) than the positively phrased SE item (I can). A similar pattern may be happening here with the attitude statements, as male PR patients may interpret negative statements to be more motivating in general. It may also be that the self-talk items chosen do

not reflect the salient instrumental and affective attitudes of male PR patients. Perhaps other self-talk statements would better reflect male PR patients' instrumental and affective attitudes. Or it could be that attitude self-talk is unrelated to instrumental and affective attitudes in males because attitude self-talk may not be meaningful or relevant to male PR patients. Although males may engage in attitude self-talk it may occur at random and be unimportant to understanding their exercise attitudes. Other types of self-talk such as personal physical evaluation self-talk may be more meaningful and relevant to male PR patients.

Overall, the gender difference observed for SE self-talk, attitudes self-talk and their corresponding social-cognitive construct highlights the need to not only measure cognitions, but understand the underlying beliefs and cognitive processes that accompany those cognitions. This finding also highlights the need for behaviour change interventions that are tailored to individuals' cognitive orientation and functional abilities, which in this case varies by gender**.** Additionally, there is a dearth of research examining gender differences in exercise motivation in older adults, but these results suggest this is an important area for future study. Furthermore, even though PR patients may engage in all of the different self-talk categories, they may not have any specific meaning to the individuals, as evident by their lack of relationship to the associated social-cognition. Likewise, specific self-talk statements may be more relevant to one gender or the other because of complex socialization influences.

Relationships for Self-Talk Frequency and Motivational Interpretation. The small-to-moderate correlations for self-talk frequency and motivational interpretation suggest that these two scales are measuring different but related characteristics of self-talk. Therefore, both frequency and motivational interpretation scales may be needed when measuring self-talk. A combination of frequency and motivational interpretation scales may give a better understanding of the processes that govern the relationships between self-talk and cognition.

Frequency scales are commonly used to assess self-talk, however a motivational interpretation scale has not previously been used to assess self-talk. The literature on self-talk indicated that self-talk valence was a commonly measured characteristic of self-talk but it fails to measure a person's interpretation of the self-talk statement (Hardy, 2006). People may interpret the same statement very differently; therefore, it is important to determine how one interprets self-talk statements, or what the significance of the statements is to the individual. The results of this study suggest that motivational interpretation may be particularly important for understanding self-talk, however, motivation is a very complex construct. A one question scale may not be comprehensive enough to tap into the full complexity of motivation. There also may be other characteristics or functions of self-talk that would enhance our understanding of the self-talk-cognition relationship, and the main function of self-talk in PR patients may not be motivation. Vygotsky (1962) maintains that the primary function of self-talk is self-regulation. It may be that self-talk is more commonly used by PR patients to

remember to do things, or assess social situations. Other functions of self-talk were assessed in this study and will be discussed later.

Secondary Research Question 1

Secondary research question 1 was to determine the degree of relationship for non-social-cognitive self-talk items and social cognitive constructs.

Consistency of Self-Talk and Social-Cognitions. Similar to the primary research question, the results suggest that the pattern of relationships for non-social-cognitive self-talk are consistent with social cognitions, in that low levels of a self-talk construct are negatively associated with high levels of a social-cognitive construct, and vise-versa. For example, negative personal physical evaluation self-talk is positively associated with perceived difficulty and negatively associated with instrumental and affective attitudes. This finding supports Meichenbaum's (1977) contention that self-talk is a way to understand underlying cognitions, and also supports the premise of social-cognitive theories – that cognitions can be explicit, and are a result of rational thinking (Conner & Norman, 2005). Self-talk may be a way to understand and change exercise-related cognitions, and potentially behaviour.

Key Non-Social-Cognitive Self-Talk and Social-Cognition Relationships. Almost all of the non-social-cognitive self-talk categories were significantly related to scheduling SE. This result may point to the complexity of scheduling SE, and the array of underlying beliefs that are associated with confidence for scheduling time to exercise. More specifically, positive and negative personal physical evaluation, reassurance, persistence and personal

pressure self-talk were all related to confidence for scheduling time to exercise. Self-talk statements that PR patients already use are related to scheduling SE, suggesting that self-talk interventions may be particularly effective at changing scheduling SE. Given that scheduling SE is a strong predictor of exercise adherence outside of rehabilitation contexts (Rodgers et al. 2002, under review) and that exercise adherence after rehabilitation is poor (Ashworth et al., 2005), developing a technique to positively influence SE is important for maintaining exercise adherence and ultimately health outcomes, such as quality of life, in PR patients.

Persistence and personal physical evaluation self-talk were the non-social-cognitive self-talk categories most related to social-cognitions. In particular, low persistence self-talk was the self-talk category related to the most social-cognitive variables, supporting the potential importance of social cognition to persistence. According to Bandura's (1986; 1997) conceptualization of SE, confidence develops as a result of persisting at activities and through the evaluation of personal and vicarious experiences (Bandura, 1997). Bandura (1997) also states that SE is an important predictor of behaviour, especially behavioural persistence in the face of challenges. If you perceive an exercise to be too difficult you may not be willing to persist with the activity, especially in the face of challenges. If you perceive exercise to have many barriers you may not be able to persist in overcoming these barriers. If you have positive attitudes towards an activity you may be more inclined to persist at an activity. In fact, persistence itself may sometimes be a result of a positive attitude towards an activity. The results of this

study highlight the relevance of social-cognitions in the theoretical understanding of behavioural persistence. However, this study is correlational and cannot discern the direction of influence for social-cognitions and persistence.

Whereas persistence self-talk was related to the greatest number of social-cognitive constructs, personal physical evaluation had the strongest relationships to certain social-cognitions among all the non-social-cognitive self-talk categories. The personal physical evaluation self-talk items included self-talk about patients' perceptions of the condition of their physical bodies. This finding indicates that bodily perceptions may be important to consider when understanding respiratory patients' motivation and exercise participation. In fact, research has indicated that bodily perceptions can impact older adults' exercise participation (Cousins & Burgess, 1992). In older male adults, exercise may be avoided because their current physical ability is not comparable to that of their younger years (Cousins & Burgess, 1992). In this case, older males would prefer not to participate at all if their current abilities are not similar to their past abilities. In older female adults, exercise may be avoided because they are concerned about revealing their aging bodies (Cousins & Burgess, 1992). PR programs and future research aimed at increasing exercise adherence in pulmonary patients should consider the influence that bodily perceptions may have on clinical outcomes, as well as acute and long-term exercise participation.

Gender Differences for Self-Talk and Social-Cognitions. Similar to the relationships for social-cognitive self-talk categories and SE, the patterns of relationships for male and female participants were different for non-social-

cognitive self-talk variables and multidimensional SE. In female PR patients, task SE was negatively related to both the frequency and motivational interpretation scales of the self-talk categories, suggesting that females who had higher task SE engaged in less non-social-cognitive self-talk, and that they found these types of self-talk un-motivating. Vygotsky (1962) asserts that self-talk primarily serves a self-regulatory function, and that low levels of self-talk are observed when the task is too easy, because the person doesn't need to self-regulate, or too difficult, because the person does not have the capacity to self-regulate at all or self-regulate effectively. It may be that female PR patients with high SE do not need to self-regulate because their confidence for the task is already high, and thus do not engage in self-talk. Over thinking may actually undermine their confidence for doing the task, and actually make the task more challenging.

Non-Social-Cognitive Self-Talk Inter-factor Correlations. Strong inter-factor correlations were seen across some of the non-social-cognitive self-talk categories suggesting that there may be some overlap in the non-social-cognitive self-talk categories. In particular, correlations between personal pressure and persistence self-talk categories were seen as high as .90, indicating the possibility of multicollinearity. It may be that these self-talk statements have the same underlying purpose or function, which could explain the strong correlations between self-talk categories. Adopting Vygotsky's view (1962), it may be that personal pressure and persistence self-talk are both key self-talk categories for self-regulation. Perhaps understanding self-talk function is more useful than understanding self-talk characteristics. A measure of self-talk function was also

examined in this study and will provide insight into this matter. The self-talk statements were grouped into categories based on my own perceptions and operational definitions of constructs. First it would be useful to determine if self-talk functions are idiographic or nomothetic. If idiographic, self-talk function would be unique to the individual and if nomothetic, self-talk function would serve a common purpose to groups of individuals. If self-talk function was nomothetic, it would be useful to conduct a factor analysis from a larger sample on the derived self-talk categories to determine statistically how the self-talk statements group together, and if it is consistent with my understanding of the categories.

Secondary Research Question 2

Secondary research question 2 was to determine the degree of relationship for social-cognitive constructs and intentions to exercise in and out of PR.

Intention in PR versus Intention out of PR. The social-cognitive constructs had stronger relationships to exercise intentions out of PR than to exercise intentions in PR. This may be due to less variability for intentions to exercise in PR. Since all patients were participating in exercise-based PR, it can be inferred that they all intend to exercise for the same number of times per week. With little variability in intentions the relationships to other variables would be expected to be small at best. It is also possible that intentions to exercise in PR are governed less by social-cognitive constructs than intentions to exercise out of PR. This can be explained by triadic reciprocal determinism (Bandura, 1986; 1997). In triadic reciprocal determinism, the model of causation underlying social cognitive

theory, (Bandura, 1986; 1997), personal characteristics (i.e., thought, beliefs, and biological properties) behaviour, and environmental influences (including social influences) all operate as interacting determinants that influence each other bidirectionally. Some sources of influence in reciprocal determinism may be stronger than others, and reciprocal influences may not occur simultaneously (Bandura, 1997). In this instance, the importance and amount of influence that thoughts and beliefs (i.e., personal characteristics) have may change as a function of the characteristics of the environment. So it may be that, exercising in PR where the environment is controlled and highly supported by program staff does not require much self-regulation. Participants of PR just need to show up; they do not need to think about what or how they are going to exercise. On the other hand, exercising outside of PR where participants need to determine when and how to exercise on their own, more self-regulation needs to occur, leading social-cognitions to play more of a role in determining intention and behaviour.

Strongest Correlates to Exercise Intentions. The social-cognitive constructs that were most strongly associated to exercise intentions out of PR were task, coping, and scheduling SE. This finding is consistent with previous research which has found SE to be a superior predictor of intention and exercise behaviour to other important predictors such as perceived difficulty and perceived behavioural control (Rodgers, Conner, & Murray, 2009). Self-efficacy has been found to be a consistent associate of exercise initiation and maintenance in a variety of settings (Blanchard et al., 2002; Millen & Bray, 2008; Rodgers et al. 2009; under-review; Scholz et al., 2005). To my knowledge however, this is the

first time that multidimensional SE for exercise has been assessed in PR patients simultaneously with other social-cognitive constructs. These results suggest that in PR patients, SE for exercise may be the most important social-cognitive construct to exercise intentions, which has been found to be the best predictor of exercise behaviour (McEachen et al., 2011). Therefore, it may be useful to construct interventions aimed at increasing SE for exercise outside of PR, in order to bring about sustained increases in exercise intentions and behaviour, and health outcomes.

Gender Differences in Self-Efficacy Correlations. In female PR patients, coping and scheduling SE were positively related to perceived difficulty, perceived severity, and barriers. In male PR patients, coping and scheduling SE were negatively related to perceived difficulty, perceived severity and barriers. Self-efficacy influences the goals people set and the challenges that they take on, such that people with greater self-efficacy will be more likely to set challenging goals and be persistent at pursuing them (Bandura, 1997). It may be that in female PR patients who have stronger SE beliefs, exercise is a challenge of optimal difficulty that they believe they can overcome. When challenging circumstances arise they have the confidence they need to overcome exercise challenges and barriers, which in turn may support their SE beliefs when they are successful. In male patients, exercise challenges may be too difficult, and when challenges arise, they do not have the resources to push through such challenges. Female PR patients had greater functional exercise capacity than male PR patients in this sample, so it may be that functional ability, gender, or their combined interaction

is moderating these relationships. Future research should investigate this matter. Male PR patients or those with less functional ability may require additional resources in PR in order to overcome exercise challenges.

Secondary Research Question 3

Secondary research question 3 was to determine the degree of relationship for all self-talk categories and self-talk functions.

Self-Talk Frequency versus Self-Talk Motivational Interpretation. The frequency scales for social-cognitive and non-social-cognitive self-talk categories were more strongly related to self-talk functions than the self-talk motivational interpretation scales. This finding is most likely due to common-method variance, as self-talk function was measured on a frequency scale as well. Also, motivational interpretation is a function of self-talk. So it may be that motivation is an independent function of self-talk apart from self-reinforcement, social-assessment, self-criticism, and self-management.

Non-Social-Cognitive versus Social-Cognitive Self-Talk. The non-social-cognitive self-talk categories had stronger relationships to self-talk functions than social-cognitive self-talk categories. Earlier it was stated that there were high inter-factor correlations across non-social-cognitive categories, suggesting that they may be measuring a similar construct, such as an underlying self-talk function. The strength of the correlations for non-social-cognitive self-talk categories and self-talk functions also suggests that this may in fact be the case. Inherent in Meichenbaum's (1977) definition of self-talk is that self-talk serves the purpose of communicating to oneself, which would help to self-

regulate one's behaviour. Therefore, it may be that the overarching purpose of self-talk is to self-regulate (Vygotsky, 1962), and that the other functions of self-talk developed by Brinthaupt and colleagues (2009) are sub-categories of self-regulation functions of self-talk. Engaging in self-talk for persistence, reassurance, and personal pressure purposes could all be tied to self-regulation. Thus, the shared purpose among all of these self-talk items could be self-regulation, which would account for the strong relationships between these variables and for their relationships to the other self-talk functions. A more in depth content analysis of the self-talk statements would perhaps provide insight into whether the self-talk statements share another common category or purpose rather than the categories that were derived from the pilot study. Conducting a factor analysis would also provide evidence of how well the groups of statements fit the self-talk categories and perhaps point to the statements that may share overlapping variance with other self-talk categories.

Gender Differences for Self-Talk Categories and Self-Talk Function. Similar to the relationships between other study variables, there were some gender differences in the relationships among self-talk categories and self-talk functions. In many instances, stronger relationships were observed for self-talk categories and self-talk functions in female PR patients compared to male PR patients. It may be that although the overarching function of self-talk is to self-regulate (Vygotsky, 1962), how male and female PR patients self-regulate and which statements they use to do so may be different. Similarly, the STS scale may not measure the self-talk functions that are most consistent with male PR patients'

self-talk purposes. There may be complex gendered socialization experiences that could impact the salience of particular self-talk statements. Research has shown that males and females seem to approach their leisure time from different perspectives based on their differing experiences throughout their lifespan (Byles et al., 2013; Kluge, 2002; Petkoska & Earl, 2009; Quick & Moen, 1998). Whereas females enjoy taking on new challenges in later adulthood because they no longer have to spend as much time caring for their families (Byles et al., 2013; Kluge, 2002) males prefer to do what they always have done (Kluge et al., 2002). The different perspectives held by male and female older adults may influence the way they self-regulate, and how much they self-regulate. These perspectives may or may not be impacted by patients' functional abilities and the importance that participants of different genders place on their functional abilities. If the perspectives are different depending on the gender or functional abilities of the PR patient the specific self-talk statements associated with each self-talk function may be different because the appraisal processes, meaning, and importance of each statement would be different. Future research should determine whether functional abilities, gender, or the interaction of functional abilities and gender moderates the relationship between self-talk functions and self-talk statements.

Secondary Research Question 4

Secondary research question 4 was to determine the relationships for social-cognitive constructs and self-talk function.

Gender Differences for Social-Cognitions and Self-Talk Function. Similar to the results of the previous research questions, gender differences were

found in the relationships for social-cognitions and self-talk functions, such that stronger relationships among the variables were observed in female PR patients compared to male PR patients. Self-talk may be a better technique to understand cognition in female PR patients than male PR patients. Self-talk may be more purposeful in female than male PR patients, giving a more clear indication of cognitive processes in females. This may be because females are more skilled users of self-talk, or that females' self-talk is more transparent than males' self-talk. Although male PR patients may engage in self-talk, a lot of it may not be meaningful. It may also be that this gender difference could be attributable to the discrepancy in functional abilities between male and female patients. Exercise may be an optimal challenge in PR patients with greater functional ability, leading to greater self-regulation (Vygotsky, 1962) and thus congruence between social-cognitions and self-talk functions compared to patients of lower functional ability.

In some of the relationships for multidimensional SE and self-talk function the direction of the correlation was reversed for male and female PR patients, such that social-cognitions tended to be positively related to self-talk functions in females and negatively related in males (although non-significant). It may not be that self-talk is a better way to get at cognitive processes in female compared to male participants, rather it may be that the relationship for self-talk and cognition in male PR patients is not as conventional as hypothesized and may be more complex than in female PR patients. For example, male PR patients may use self-talk in a different way, and the statements they find motivating may be different than female PR patients. Another explanation, for the inconsistency in

relationships among the self-talk variables and cognitions by gender is that female PR patients may be more skilled users of self-talk. Male PR patients may be aware that they are saying statements to themselves, but they might not be aware of how they can use it to better achieve their goals. Similarly, it may be that functional ability is responsible for the difference in relationships between self-talk function and social-cognitions. When tasks are too difficult people are either not able to self-regulate at all or not able to self-regulate effectively (Vygotsky, 1962), which could explain the stronger, positive relationships between self-talk function and social-cognition in female PR patients who have greater functional abilities compared to male PR patients who have poorer functional abilities.

Secondary Research Question 5

Secondary research question 5 was to determine the degree of relationships for self-talk categories and PR clinical indicators, the 6MWT and SGRQ.

Strongest Associates to PR Clinical Indicators. Of the social-cognitive self-talk categories, frequency of low perceived difficulty and high perceived severity were most strongly related to the 6MWT and the SGRQ, such that those who frequently said low perceived difficulty self-talk and infrequently said high perceived severity self-talk walked further on the 6MWT and had better health status. The strength and direction of the relationships for perceived difficulty and perceived severity self-talk to the 6MWT and the SGRQ is consistent with what these clinical indicators assess. The 6MWT assesses the global and interactive functioning of the systems involved in exercise, including the cardiovascular,

pulmonary, circulatory, and muscular systems (ATS, 2002). The functioning of individuals' exercise systems may contribute to the overall difficulty of performing exercise tasks. Similarly, the functioning of the pulmonary system partially contributes to performance on the 6MWT suggesting that pulmonary functioning, and subsequently pulmonary disease severity, is important to 6MWT performance. Therefore, the relationships of perceived difficulty and perceived severity self-talk to the 6MWT suggests that PR patients' self-talk is consistent with their functional ability levels.

The SGRQ assesses the disease specific impact on overall health, daily life, and perceived well-being in patients with pulmonary diseases (Jones et al., 1991). In the current study, the SGRQ was related to markers of actual disease severity and clinical indicators, including lung function, functional exercise capacity, and perceived breathlessness. The SGRQ seems to either directly and/or indirectly through other variables tap into one's perceptions of their disease severity. Therefore, the relationship between the SGRQ and perceived severity self-talk supports the validity of this self-talk category and suggests that this self-talk category is meaningful and relevant to PR patients' health outcomes.

Of the non-social-cognitive self-talk categories, positive and negative personal physical evaluation showed the strongest relationships to the 6MWT and SGRQ, such that positive self-talk frequency was associated with greater distance on the 6MWT and greater health status, and negative self-talk frequency was associated with less distance on the 6MWT and poorer health status. Personal physical evaluation self-talk was operationalized as the language used by a person

that states their opinion of their physical body. The relationship between personal physical evaluation self-talk and the 6MWT suggests that one's perception of their physical body is related to the actual functioning of their body, which provides convergent validity support for this self-talk category. Furthermore, the relationship between this self-talk category and the clinical indicators suggests that one's perceptions of their physical body may be important to assess and consider in PR settings. This interpretation is consistent with social-cognitive theories, which emphasize the importance of perceptions over objective reality in understanding human behaviour (Conner & Norman, 2005).

Gender Differences for Self-Talk Categories and the 6MWT. The results indicate that the relevance of self-talk categories to the clinical indicators depends on the sex of PR patients. In females, high perceived difficulty self-talk frequency was most strongly (and negatively) related to the 6MWT. The 6MWT is an assessment of the overall and integrated functioning of all the systems involved in exercise, including, circulation, cardiovascular, pulmonary, and muscular systems (ATS, 2002). Impairment in one or any combinations of these systems may make performing exercise tasks more difficult. Thus, the positive relationship between high perceived difficulty self-talk and the 6MWT suggests that females' self-talk is consistent with their ability levels.

In males, positive personal physical evaluation self-talk frequency was the strongest associate to the 6MWT, such that males who more frequently said these types of statements had greater functional exercise capacity. Positive personal physical evaluation self-talk are statements that indicate a favourable opinion

about the functioning of one's physical body, such as "I feel strong". The relationship between positive personal physical evaluation self-talk and the 6MWT suggests that males' perceptions of their abilities are consistent with their actual abilities. Personal physical evaluation self-talk has been related to many variables in this study, including social-cognitions and clinical indicators. This finding suggests that physical ability perceptions are important to male PR patients. This interpretation is consistent with a previous study by Cousins and Burgess (1992) which found that discrepancies between past and current abilities can impact exercise participation. It may be useful to target male PR patients perceptions of their physical abilities in future research and interventions.

Self-Talk, Cognition, and the 6MWT in Males. The stronger relationships of self-talk to clinical indicators compared to the weaker relationships of self-talk to cognitions in male PR patients suggest an unclear pattern of relationship between self-talk, cognition, and functional exercise capacity. It may be that male PR patients do not have a good understanding of their exercise-based perceptions. Or it may be that the inconsistent relationships among the study variables are in part due to the way that self-talk was measured. Patients were asked about their use of experimenter-provided self-talk statements about exercise. Thus, salient self-talk statements may not have been assessed. The challenge may be determining which statements are meaningful and have the potential to influence behaviour. Thus far, the results of this study coupled with work by Cousins and Burgess (1992) has indicated that personal physical evaluation self-talk may be meaningful to male PR patients. Also, self-talk may

simply be a random occurrence. Or at times it may be purposeful, and self-directed. If the self-talk measurement in this study captured random self-talk only, the relationships of self-talk to other study variables could be spurious. However, if the self-talk measurement in this study captured purposeful self-talk the relationships of self-talk to other study variables may be meaningful and indicative of important relationships. It is impossible to determine from the present study whether the self-talk was self-directive or just observed as having naturally or spontaneously occurred. Similarly, there is no way to determine from the current study whether planned self-talk might be a useful vehicle for changing social-cognitions, although it warrants future consideration.

Secondary Research Question 6

Secondary research question 6 was to determine the degree of relationships for social-cognitive constructs and PR clinical indicators.

Key Social-Cognition and 6MWT Relationships. Of the social-cognitive constructs, the two strongest associates to the 6MWT were perceived severity followed by task SE. The strength of the association for perceived severity and the 6MWT is consistent with the literature on health outcomes in COPD patients. Actual illness severity, such as lung function, is not predictive of mortality (Nishimura et al., 2002), or PR outcomes (Fan, Giardino, Blough, Kaplan, & Ramsey, 2008; Garrod, Marshall, Barley, & Jones, 2006; Selzler, Simmonds, Rodgers, Wong, & Stickland, 2012). Rather, perceptions of illness severity seem to be much more predictive of mortality (Nishimura et al., 2002) and drop-out of PR (Fan et al., 2008; Garrod et al., 2006; Selzler et al., 2012). The perceived

severity construct measured in the current study was a global assessment of disease severity (i.e. “My lung disease is severe”). Past research has used symptom specific measures of disease severity such as degree of breathlessness. Thus the results of this study adds to the current literature by suggesting that one’s global evaluation of their disease severity is also related to relevant clinical indicators in PR patients.

Functional exercise capacity, as measured by the 6MWT, is an important outcome of PR because patients’ functional ability is paramount to their ability to live independently (Lacasse et al., 2006). Task SE was found to be a strong correlate of functional exercise capacity, which is consistent with the conceptualization of task SE. Task SE pertains to one’s perceptions of their capabilities to perform the movements associated with exercise (Maddux, 1995), many of which movements are similar to those performed while walking during the 6MWT. The positive association between task SE and the 6MWT indicates that PR patients’ perceptions about their capabilities are consistent with their actual capabilities. The strength of the relationship between task SE and the 6MWT suggests that task SE may be an important cognition to assess in PR patients. Given that functional limitations are common among PR patients and that one of the goals of PR is to improve patients’ functional abilities, patients’ beliefs about their abilities is subsequently important. In contrast, in populations that do not have the same degree of functional impairment, task SE may be less important than other social-cognitions because their abilities allow them to focus on other aspects of exercise tasks, such as scheduling time to exercise.

Exercise and coping SE were the only social-cognitive constructs not related to the 6MWT. The lack of association between intentions and the 6MWT may be a result of little variability in the intention construct. Since participants were all beginning the PR program it is reasonable to infer that they all had high intentions to exercise, or else they would not have signed up for and attended the PR classes at all. It may also be that PR patients' intentions to exercise have little to do with performing a functional ability assessment.

The lack of association between coping SE and the 6MWT could be due to a variety of reasons. Coping SE has been found to be associated with exercise in CR populations (Blanchard et al., 2002; Millen & Bray, 2008), and due to the symptoms and functional impairment of PR patients, it would be expected that coping SE be particularly relevant to functional exercise capacity in PR patients. However, patients entering PR have just begun exercising and may not have had a variety of experiences where they have encountered barriers to exercise. Therefore, their responses to the coping SE item may not have been accurate, or coping SE may not be relevant to behaviour at this time. Some research suggests that coping SE is more associated with exercise persistence than with exercise initiation (Rodgers et al., 2002, 2009), thus supporting this contention. Research determining the relationship between coping SE and the 6MWT at the end of PR would provide insight into this matter.

Due to participant burden, coping SE was assessed by a single item, " how confident are you that you can do your exercises when they cause you some discomfort". This single item alone may not completely encompass all aspects of

the coping SE construct that are relevant to PR patients exercise cognitions. Also, coping SE was developed and tested with healthy adults, and adults participating in cardiac rehabilitation. It may be that 'discomfort' means something completely different to PR patients than it does to cardiac patients or healthy adults. Since the primary symptom of PR patients is breathlessness, PR patients may think of breathing discomforts when they are responding to the coping SE item. It may be useful to include a more comprehensive measure of coping SE in PR patients in the future and separate coping with breathing discomfort from the other exercise barriers.

Gender Differences in Relationships for Social-Cognitions and PR Clinical Indicators. Similar to the relationships for SE and other study variables, the relationships for SE and PR clinical indicators appear to vary by gender. In male PR patients, a moderate positive relationship was found for scheduling SE and the 6MWT, whereas in female PR patients no significant relationship was found. The 6MWT assess the overall and integrated functioning of the bodily systems involved in exercise, including the cardiovascular, pulmonary, circulatory, and muscular system (ATS, 2002). In males, it may be that those with lower functional exercise capacity are less confident that they can schedule time to exercise because they are concerned about exacerbations or days that they will have to take off from exercise, making them less confident about scheduling time to exercise. Likewise, males who have greater functional exercise capacity may be less worried about their disease symptoms impacting their ability to schedule time to exercise. This relationship is speculative and warrants further

investigation. The relationship between scheduling SE and the 6MWT suggests that scheduling SE may be a relevant social-cognition to assess in PR patients.

In female PR patients, a moderate positive relationship was found for instrumental attitudes and the 6MWT, whereas in male PR patients no significant relationship was found. Examination of the means and standard deviations of instrumental attitudes in male and female patients indicated that there was a ceiling effect and low variability. Research has indicated that in the exercise domain it is common for instrumental attitudes to have observed means of greater than 6.0 on a 7-point likert scale and standard deviations of less than 1.0 (Courneya, Blanchard & Lang, 2001; Courneya & McAuley, 1995). The skewed distribution may reduce the ability to detect associations between instrumental attitudes and functional exercise capacity. As indicated by Courneya, Conner, & Rhodes (2006), it may be either that the descriptors of the scale are not extreme enough, or that the scales do not provide enough options for participants. In undergraduate students, Courneya et al. (2006), found that including more extreme descriptors at the polar ends of the scale along with larger scales increased the variability in TPB constructs; however, these scale changes did not improve the predictive ability of the TPB constructs. Participant characteristics such as age (McEachen et al., 2011) and socio-economic status (Janssen, Sugiyama, Winkler, de Vries, Poel & Owen, 2010) have been shown to moderate the relationship between social-cognitive variables and behaviour. Thus, determining the optimal scale and descriptors in PR patients is warranted.

Examination of the attitude means suggest that PR patients have positive exercise attitudes. This may not relate to the functional abilities of male PR patients because the degree of impairment is quite high among many patients in this group, and in fact significantly higher than female PR patients. Therefore, thinking that exercise is beneficial may not relate to ability levels in people who have functional limitations. More research aimed at understanding the salient motivational characteristics, and their relationship to relevant clinical and behavioural outcomes in this population is needed.

Secondary Research Question 7

Secondary research question 7 was to determine the degree of relationship for self-talk functions and PR clinical indicators, SGRQ and the 6MWT.

Self-Talk Function and the SGRQ in Females. In female PR patients, moderate positive correlations were found for self-talk functions – social assessment and self-criticism, and the SGRQ subscales and total score. This indicates that females who used self-talk to criticize themselves and navigate social situations tended to have lower health status. Previous research has found that self-criticism and social assessment self-talk are associated with negative self-talk statements in healthy adults (Brinthaupt et al., 2009). So it may be that the relationships of health status to self-criticism and social assessment self-talk indicate an overall negative way of thinking. Although self-talk can be useful, it may also be harmful. Self-talk may also provide evidence of positive and negative patterns of thinking that might suggest poor prognosis of patient outcomes. Identifying positive and negative patterns of thinking may help PR staff provide

support and resources to the PR patients who need it most. Future research should determine if PR alone, or a specific self-talk intervention, can change negative self-talk patterns, and if that change further relates to change in health status and other PR outcomes.

Secondary Research Question 8

Secondary research question 8 was to determine the degree of relationship for perceived illness severity – MRC dyspnea scale and perceived severity, and actual severity as measured by lung function – FEV1 % predicted and FEV1/FVC.

Perceived Severity versus Perceived Breathlessness. The general perception of disease severity (perceived severity social-cognitive construct) had a stronger relationship to actual severity over perceived breathlessness (MRC dyspnea scale). Although the salient symptom of PR patients is breathlessness (O'Donnell et al., 2007), there are other symptoms associated with lung diseases such as coughing, wheezing, and pain. Also, many PR patients have comorbid diseases such as cardiovascular disease, cancer, osteoporosis, and peripheral muscle dysfunction (O'Donnell et al., 2007). Therefore, a general measure of perceived severity may capture a greater range of people's perceptions of their illness than a measure of perceived breathlessness leading to a greater association to actual severity.

Gender Differences in Perceived and Actual Illness Severity. The strength of relationships for perceived illness severity and actual severity was much stronger in female compared to male PR patients. So far the results have

indicated that female PR patients' cognitions are more strongly related to their behaviour and health status than male PR patients. It may be that female PR patients are more self-aware and cognisant of their thoughts and their bodies than male PR patients, thus creating greater congruence between perceived and actual severity.

Secondary Research Question 9

Secondary research question 9 was to determine the degree of relationship for social-cognitive variables, MRC dyspnea scale, and lung function (FEV1% predicted, and FEV1/FVC).

Social-Cognitions More Related to Perceived than Actual Severity. Social-cognitive constructs were more related to the MRC dyspnea scale than to lung function. Social-cognitive constructs and the MRC dyspnea scale both assess individuals' perceptions, thus a greater congruence is to be expected for the perceptions scales compared to the perception and actual lung function scales, as the perception scales are measuring more similar constructs. Also, perceptions can be influenced by common factors that may or may not relate to actual perceived severity factors as evidenced by the stronger relationship between perceived severity and morbidity than actual severity and morbidity (Nishimura et al., 2002).

Perceived Severity Most Related to Lung Function. Apart from perceived severity, none of the cognitions were significantly related to lung function. Whereas the perceived severity construct assessed individuals' perceptions of their illness, the other social-cognitive constructs measured

individuals' perceptions of exercise. Very small and non-significant relationships were found between the exercise social-cognitive constructs and lung function variables because the two categories of variables are measuring different and non-congruent constructs. The perceptions targeted in the social-cognitive constructs are probably only indirectly related to lung function through other variables.

Secondary Research Question 10

Secondary research question 10 was to determine the degree of relationship for self-talk items, the MRC dyspnea scale, and lung function.

Gender Differences for Social-Cognitive Self-Talk, MRC, and Lung Function Relationships. In male PR patients, the social-cognitive self-talk item that was most strongly related to the MRC dyspnea scale and lung function was perceived severity, such that those with more frequent high perceived severity self-talk also perceived a high amount of breathlessness, and had poorer lung function. The fact that perceived severity self-talk emerged as the strongest associate of breathlessness and lung function points to the relevance of this type of self-talk to male PR patients, provides support for the validity of this self-talk category, and also indicates that their perceived severity self-talk is in line with their perceived and actual illness severity. Future research should continue to understand the role that perceived severity and perceived severity self-talk has in determining PR patient health outcomes, and if it can be used to influence such outcomes.

In female PR patients, the social-cognitive self-talk item that was most strongly related to the MRC dyspnea scale was high and low frequency of

perceived difficulty self-talk. Females who frequently said ‘exercise is difficult’ and infrequently said ‘exercise is easy’ perceived themselves to have high levels of breathlessness. The breathlessness caused by exercise exertion is more extreme in patients with lung diseases than in people with healthy lungs because their resting levels of breathlessness are greater (O’Donnell et al., 2007). It may be that a large part of why PR patients find exercise to be difficult is because they feel short of breath. In fact, many people refrain from attending exercise-based PR because of the burden of COPD symptoms (Keating et al., 2011), Given that breathlessness is the main symptom of COPD (O’Donnell et al., 2007), it is not surprising that PR patients would frequently articulate a statement to themselves that reflected how difficult they find exercise to be (because of their breathlessness).

Non-Social-Cognitive Self-Talk, MRC, and Lung Function Relationships. For the non-social-cognitive self-talk categories, both the frequency of positive and negative personal physical evaluations had the strongest correlations to the MRC dyspnea scale and lung function, particularly in male PR patients. Males who frequently said negative physical evaluation self-talk statements had poor lung function and males who frequently said positive physical evaluation self-talk statements had better lung function and low perceived breathlessness. The severity of one’s illness, as determined by lung function and breathlessness, may be impacting male PR patients’ perceptions of the condition of their physical body. These perceptions may also be a function of age as well. Illness does negatively impact one’s body, and the fact that male PR

patients are aware of it and articulating it to themselves indicates that it is an important consequence of their illness to them. This interpretation is consistent with previous research that has found declined physical abilities to be an indicator of exercise non-participation in older male adults (Cousins & Burgess, 1992). Personal physical evaluation self-talk was also strongly related to a number of cognitions in male PR patients, such as scheduling SE, perceived difficulty, barriers, and attitudes. Given that social-cognitions have been found to be predictors of exercise adherence (McEachen et al., 2011, Rodgers et al., 2008), it may be particularly important to address male PR patients' perceptions of their physical body, possibly though self-talk, so that greater adherence to exercise can be achieved.

General Discussion of Gender Differences in Self-Talk, Perceived and Actual Severity. Whereas perceived severity was the most important construct to perceived breathlessness and lung function in males, perceived difficulty was the most important construct in females. Similarly, personal physical evaluation self-talk was more related to perceived and actual severity in male patients. The gender differences found in the relationships among self-talk, perceived breathlessness, and lung function build on the other results of this study, and together they seem to indicate that male and female PR patients' differing perceptions of exercise and how their illness is manifested in their bodies may have different impacts on their behaviour. This finding is important for the consideration of future interventions to increase exercise adherence in PR.

Secondary Research Question 11

Secondary research question 11 was to determine the degree of relationship for self-talk function the MRC dyspnea scale, and lung function.

Self-Talk Function and Lung Function in Females. Among female PR patients, those with lower lung function tended to use more self-reinforcement self-talk. Self-reinforcement self-talk refers to self-talk used when feeling proud of something one has done and when something good has happened (Brinthaupt et al., 2009). Research has indicated that self-reinforcement self-talk is related to automatic positive self-talk statements (i.e., the frequency that positive self-talk statements "pop into people's heads"), private self-consciousness (i.e., the tendency to focus on ones thoughts, feelings, and emotional states), self-reflection, and internal state awareness (Brinthaupt et al., 2009). It may be that self-reinforcement self-talk is a technique used by females PR patients to help them put a positive spin on the condition of their disease as a way to emotionally cope. This relationship may be stronger in females with poorer lung function because the awareness of the severity of their illness is more salient than females with better lung function, thus leading females with poorer lung function to take action toward coping. This interpretation is speculative, and more direct investigation of this matter should occur before conclusions are drawn.

Secondary Research Question 12

Secondary research question 12 was to determine the degree of relationship for perceived severity, MRC dyspnea scale, lung function, the 6MWT and SGRQ.

Relationship of Perceived Severity Scales. The perceived severity scales – the social-cognitive construct perceived severity, and the MRC dyspnea scale, are only weakly related. However, both scales have moderate correlations to actual illness severity as measured by lung function. This suggests that the two perceived severity scales measure different attributes of perceived severity. Perceived severity is a global perception of one's illness, whereas the MRC dyspnea scale is a disease specific perception of breathlessness. Many PR patients have comorbid illnesses so although breathlessness may be the salient symptom (O'Donnell et al., 2007); it is not the only symptom of their illnesses. It might be important to include both a disease specific and general indicator of perceived illness severity when understanding behaviour and determining outcomes associated with PR patients.

Perceived Severity and the 6MWT. Moderate negative correlations were found for the perceived illness severity variables and the 6MWT, and very small correlations for lung function and the 6MWT. This finding indicates that PR patients' perception of their illness is more related to physical functioning than the actual severity of their disease. This is in line with previous research that has found perceptions of illness severity to better predict mortality (Nishimura et al., 2002) and drop-out of PR in COPD patients (Fan et al., 2008; Garrod et al., 2006; Selzler et al., 2012). PR may be an optimal time to target PR patients' perceptions of their illness in order to bring about positive changes in PR outcomes, and also produce a lasting change in such outcomes.

General Discussion

Self-talk is the silent conversation that one has with oneself about their thoughts and feelings, and is a self-communication system that influences affect, thought, and behaviour (Meichenbaum, 1977). In this view, self-talk is conscious, directive, and provides evidence of underlying cognitive structures and processes. At first glance, Meichenbaum's description of self-talk seems clear, and simple. However, the results of this study point to the complexity of the self-talk, cognition, and behaviour relationships. The relationships are likely bi-directional; self-talk can influence cognition and behaviour, and behaviour and cognition, particularly appraisal processes, can also influence self-talk. The bidirectional relationship between cognition, behaviour, and environmental influences is described in triadic reciprocal determinism (Bandura, 1986; 1997). For example, high levels of SE are associated with behavioural adherence (Bandura, 1997), so enhancing SE (cognition) should lead to greater adherence (behaviour). Behaviour, such as mastery experiences, can in turn be used to enhance SE through appraisal processes. These relationships may in turn change as a function of the environment. The bidirectional relationships for cognition, behaviour, the environment as well as self-talk becomes challenging to decipher and explain in a correlational study. However, the results of this study seem to indicate that self-talk may be a useful self-directed technique for understanding cognition and behaviour, over and above that determined by a cognition and behaviour questionnaire. Self-talk provides insight into the cognitive process and beliefs that are salient to individuals.

The relationships for self-talk, cognition, and behaviour vary by gender of PR patients. Cognition and self-talk was related to functional abilities in both male and female PR patients, with some constructs being more or less important depending on patient gender. The difference in these relationships could be a function of patient gender, or it may be a function of exercise capacity. The females in this sample were much more functionally capable than the males, which could influence cognition, and appraisal processes. Or it may be that females interpret and appraise things differently than males. Although this study cannot indicate which explanation to adopt, it does highlight that these two groups do indeed think differently, and that different approaches to changing self-talk, cognition, and behaviour need to be taken depending on the characteristics of the individual. Similarly, the results also suggest that different cognitions and self-talk may need to be targeted in male and female patients in order to achieve the same outcome of increased physical activity, and health status.

Research on self-talk is based on the assumption that self-talk provides evidence of underlying cognitions, and that by changing self-talk you can change cognition, and behaviour. However the results suggest that the relationships for self-talk, cognition, and behaviour are not clear. Researchers have investigated characteristics of self-talk such as valence (Tod et al., 2011; Zinsser et al., 2010), functions of self-talk (Brinthaupt et al., 2009; Hardy et al., 2001; Vygotsky, 1962), and functional significance of self-talk to individuals (Oliver et al., 2009), but have yet to clearly determine which cognitions self-talk is providing evidence of, and what it is about self-talk that influences behaviour. This study extends the

literature on self-talk by investigating its relationship to known social-cognitions, and supports the claim that self-talk provides evidence of underlying cognitions (Meichenbaum, 1977).

Vygotsky (1962) has suggested that self-talk primarily serves a self-regulatory function. This study found that self-talk function may indeed be important to asses. The strong correlations for specific self-talk categories (which are comprised of specific self-talk statements) and self-talk functions indicate that there may be a common denominator between these variables. In particular, the self-talk categories of reassurance, personal pressure, and persistence were strongly related to the self-talk functions. It may that the statements representing these self-talk categories were examples of statements that can be used for those self-talk functions. The strong correlations across the self-talk categories and self-talk functions suggest that there may be an overarching function of self-talk, which may be to self-regulate. Within the definition of self-talk that was adopted from Meichenbaum (1977), a function of self-talk, self-communication, is also adopted. Functions of self-talk imply that self-talk and therefore cognition is best understood as a process, rather than a characteristic. Similarly, although behaviour can be described and defined in terms of a characteristic, behaviour change is a process. Therefore, self-talk function may be particularly important to consider when understanding cognitions, and changing behaviour.

This research highlighted the importance of considering the consequences of positive and negative self-talk. Some of the relationships for self-talk and PR clinical indicators indicated that it might be possible for self-talk to hinder

behaviour and have negative impacts on health status. When creating interventions, there is a need to not only increase positive functions or characteristics of self-talk, but also decrease negative functions and characteristics.

The self-talk categories that had the most and strongest associations to social-cognitions and PR were SE, perceived severity, perceived difficulty, and personal physical evaluation, indicating that these types of self-talk statements may be relevant for understanding clinical indicators in PR patients, and potentially exercise behaviour. The social-cognitions that these self-talk categories have been deemed to represent have been found to be important associates of health behaviours. SE has been found to be a robust predictor of exercise adherence in a variety of settings (Bandura, 1997), and appears to have different associations to PR clinical indicators among male in female PR patients. Performing exercise tasks is a major component of PR, thus one's confidence in their capabilities to perform this behaviour is pertinent (Bandura, 1997). Perceived difficulty, which is related to SE, has also been found to be an associate of health behaviours (Rodgers, Conner, et al., 2008). Since PR patients are initiate exercisers and functionally limited, their ability to exercise may be contingent on the difficulty to which they perceive the task to be. Perceived severity, which is a construct not well studied, seems to be particularly important for understanding clinical indicators in this population. Many of the patients in PR are functionally impaired. Therefore, their perceptions of their illness may drive how much exercise they think they can and want to participate in. Personal physical

evaluation, which pertains to ones perceptions of their physical body, was consistently associated with other variables in this study, such as health status, quality of life, and social-cognitive constructs. Self-image has been found to be a factor underlying older adults exercise participation, with males concerned about their ability and females concerned about their appearance (Cousins & Burgess, 1992). Perceptions about their body may be important to assess in future studies among PR patients.

The results of this study also add to a growing body of literature which suggests that perceptions are important to assess in patients with lung diseases. Similar to past research perceived severity seems to be more important than actual severity in predicting mortality (Nishimura et al., 2002) and relevant outcomes to PR, such as drop-out (Fan et al., 2008; Garrod et al., 2006; Selzler et al., 2012) and functional exercise capacity (Garrod et al., 2006). As Bandura (1997) points out, it is not one's actual capabilities but their belief in their capabilities that is important for understanding and predicting behaviour.

A number of gender differences were found in the relationships among study variables that may, in part, be due to different socialization processes of male and female older adults (i.e., adults over 50 years) throughout their lifespan. Socialization differences may lead to different perspectives on retirement and leisure time, which may ultimately impact their exercise participation in different ways. Females tend to use retirement as a time for taking on new roles, challenges, and interests (Byles et al., 2013). Earlier in life females adopt multiple caregiving roles as mother and wife which have compromised their leisure time

(Kluge, 2002). Females value their independence in older adult hood and not only enjoy taking charge of their leisure time (Kluge, 2002) but are also more likely than males to engage in health planning and leisure/interpersonal planning in retirement (Petkoska & Earl, 2009). Conversely, males tend to engage in more financial planning for retirement than females (Quick & Moen, 1998) and adopt more concrete goals for retirement rather than abstract goals as females tend to (Hershey, Jacobs-Lawson, & Neukam, 2002). It seems that males and females in older adult hood may approach their leisure time from different perspectives, and that these perspectives are based on different past experiences.

Males and females' perceptions of their physical body may also be due to differential past histories and socialization experiences, which in turn may impact their activity participation in different ways. In fact, research has shown that older males and females refrain from exercise because of threats to their self-image; however the self-image mechanisms responsible for potential non-participation are different in males and females (Cousins & Burgess, 1992). Older males may refrain from activity participation because their current physical ability does not match that of their youth, and if they are no longer able to perform at their youthful level they would rather not participate at all (Cousins & Burgess, 1992). Females may refrain from exercising because they have been historically discouraged from sport and vigorous forms of exercise and prefer to avoid exposing their aging figure (Cousins & Burgess, 1992). Although the outcome of activity participation or non-participation may be the same for both genders, the socialization processes of males and females may be quite different. Gender

differences may easily be overlooked if the outcome of activity participation or non-participation is the same in males and females. However, the mechanisms that are responsible for activity participation or non-participation may be different in males and females, suggesting that a different focus and approach to activity adherence may need to be taken for each gender. Future research and interventions should take into account the possibility of gender socialization differences.

The pattern of relationships across study variables was inconsistent causing some associations to be difficult to interpret. For example, sometimes it was found that positive levels of social-cognitions were positively associated with positive self-talk and negatively associated with negative self-talk and sometimes it was found that positive levels of social-cognitions were positively related to negative self-talk. The self-talk measured in this study was naturally occurring self-talk. The inconsistency in the pattern of relationships between variables suggests that naturally occurring self-talk is highly variable and random. These two characteristics make naturally occurring self-talk difficult to measure. The random and variable characteristics of naturally occurring self-talk also make its relationships to other variables random, variable, and inconsistent. Therefore, it may not be feasible, beneficial, or useful to measure naturally occurring self-talk. Self-talk may be useful if it used in a self-directed way as a vehicle for controlling and modifying thoughts and their consequential behavioural outcomes. Self-talk has been found to influence behaviour in clinical, sport, and developmental

psychology, and thus warrants further investigation of its use in exercise psychology.

Strengths

A literature search indicated that this is the first study to measure social-cognitive constructs across multiple theories in PR patients. There is a lack of research on behaviour change and social-cognitions in PR patients, thus this study adds to the literature by contributing to the understanding of the social-cognitions that might be important targets of behaviour change interventions. The assessment of social-cognitions was complimented by the assessment of self-talk function, frequency, and motivational interpretation, also a novel undertaking in this population. The investigation of self-talk is a study strength because it described how cognitions can be represented in thought, and pointed to salient thought processes that may influence exercise behaviour and clinical indicators in PR patients. This greater understanding of thought processes will help inform future self-talk interventions, and also other interventions that are based on social-cognitive theories.

This study also included approximately equal numbers of male and female participants, allowing for gender comparisons to be made. Examining gender differences is important for enhancing our knowledge of this patient population and will contribute to our understanding of the challenges faced by groups of patients, and ultimately inform the creation of the most effective interventions across the greatest number of people. Other characteristics that might be

important to consider in future research are disease severity, time since diagnosis, education, marital status, and support systems.

Limitations

Participation in this study was voluntary. Therefore, there may be differences between those that agreed to participate and those that did not. Information about participants who did not agree to participate in this study was not available; therefore we are unable to determine what, if any differences between those who participated and those who did not might be. It could be speculated, however, that a self-selection bias might exist. That is, the participants were volunteers and may have been more eager and motivated from those who chose not to participate. Also, PR patients were recruited from one PR program in Edmonton. It may be that the patients attending this PR program were different from the general PR patient population. In addition, people with lung diseases participating in PR may be different from people with lung diseases who do not participate in PR. Therefore, caution should be taken when generalizing the results to people with lung diseases who have not participated in PR.

Although the majority of the participants in this study were diagnosed with COPD, this sample was not homogenous, nor was it heterogeneous enough to make comparisons across disease groups. Although all participants have lung disease, there may be important differences between the groups of people from different diseases. These differences may be tied to the etiology of the disease, which may be fundamentally tied to their behaviours. For example, COPD is a disease primarily caused by smoking. The behaviours and coping strategies of

people with COPD who have smoked all of their lives may be quite different from people with bronchiectasis and asbestosis, who may not have such an extensive smoking history. A more homogenous sample of lung disease patients would be preferable in order to interpret the results more clearly.

One potential limitation in measurement could be the lack of experience that participants had with exercise. For many lung patients beginning PR, exercise is somewhat of a foreign activity. This population is generally older adults, many of whom have been active during their occupations, or through caring for the family home. Although their experience with activities of daily living and occupational physical activity may be plentiful, their experience with structured exercise may be limited. For some, their only experience with structured exercise before responding to the questionnaire has come from their week of experience at the lung centre. This limited amount of exercise experience may lead to thoughts about exercise that are somewhat naïve. Nonetheless, these thoughts are important as they are salient to this population upon entering PR, and thus provide useful and relevant information. Furthermore, social-cognitive and self-talk data were collected during the 2nd week of PR to ensure that beliefs were based on actual experience with structured exercise that is encountered in PR settings. As completion of PR and greater experiences with exercise accumulate, beliefs about exercise may change. Therefore, the results of this study may only be generalizable to respiratory patients just beginning PR who have limited experiences with exercise.

An additional limitation in measurement pertains to the exercise self-talk questionnaire developed from the pilot study interviews. The self-talk statement coding was done entirely by one researcher which may have introduced bias. A more rigorous approach would have been to have another researcher independently code the self-talk statements. This would allow inter-rater reliability to be assessed. The inconsistent relationships between the social-cognitive self-talk scales and the corresponding social-cognitions may be a consequence of the single-researcher coding. It may also be that the lack of consistent relationships between self-talk and other constructs is due to the random nature of general thoughts about exercise. The inconsistent associations between self-talk and clinical outcomes support this interpretation. It is likely that both the exercise self-talk assessment (in the current form) and the random nature of self-talk have contributed to the inconsistent associations between constructs. For these reasons, the current form of the exercise self-talk questionnaire is not useable for future research. Associations of self-talk to social-cognitions and clinical indicators may be misleading and inaccurate. Thus, the results of this study should be interpreted with caution.

The definition of self-talk used in this study, as proposed by Meichenbaum (1977), was that self-talk is the silent conversation that one has with oneself, and is an intrapersonal communication system that influences affect, thought, and behaviour, stipulates that self-talk is conscious. Thus, this study can only make generalizations to thoughts that people were aware of. As thought can be both conscious and unconscious, it is probable that patients had thoughts that they were

unaware of that may be important associates of social-cognitions and PR clinical indicators. Likewise, conscious thoughts may influence behaviour in unconscious ways, which may have impacted the relationships among study variables.

This study is cross-sectional and non-experimental. From the study design it cannot be concluded that self-talk and social-cognitions caused health status or functional exercise capacity. Rather, it can only be concluded that there is a relationship between the study variables and that a bidirectional association is probable in many of the relationships investigated.

Implications

This study supports the notion that self-talk provides evidence of underlying cognitions (Meichenbaum, 1977), and is a tool that can be used to understand cognitive structures and processes. Self-talk also appears to be relevant to understanding and explaining health status and functional abilities in PR patients. As self-talk is something that some patients' are already aware of and is inexpensive to administer, it may be a useful intervention technique to improve PR outcomes, including health status and physical activity in PR patients.

The results of this study also indicate that male and female PR patients are different not only in their functional abilities, but also how they think about exercise. Gender and functional differences should be taken into account when delivering and designing interventions to increase physical activity in PR patients. Different constructs may be more salient to male patients than to female patients, or to patients with more or less functional ability. Similarly, male and female PR patients may interpret the same statement very differently, resulting in different

effects on the target behaviour. While it is important to increase positive content and functions of self-talk, it may also be just as important to decrease negative content and functions of self-talk.

Conclusions

Self-talk is related to known social-cognitive constructs, health status, lung function, and functional exercise capacity in PR patients. The self-talk, cognition, and clinical indicator relationships are complex and vary by gender of PR patients. The inconsistent relationships between self-talk, cognition, and clinical indicators suggests that not all naturally occurring self-talk is meaningful, and that self-talk may be best used to influence cognitions and behaviour in a self-directed way. Furthermore, male and female PR patients may have different salient beliefs and cognitions. The physical capabilities of PR patients may account for some of the gender differences among the relationships between constructs. Gender differences may also be due to the different socialization of males and females throughout their lifespan.

Future Directions

Many future directions could be taken based on the results of this study. First, it is necessary to validate a self-talk questionnaire about exercise. The exercise self-talk questionnaire developed in the pilot study may not be suitable for future research in its current form. Some very strong correlations between self-talk categories suggest that there may be an overarching self-talk category or function being represented. A more in-depth content analysis, followed by a factor analysis would begin to determine the self-talk categories represented in the

questionnaire. Also, the motivational interpretation scale should be given more thought. Motivation is a complex construct to measure, which may not be fully captured by one item. Although motivational interpretation may be important for understanding self-talk, an entire questionnaire devoted to motivational interpretation may better capture the complexity of the construct.

Prospective studies examining the change of self-talk over time, and the subsequent impact of that change on PR outcomes, such as health status, functional exercise capacity and physical activity behaviour would provide insight into the stability of self-talk over time, and the impact of PR on self-talk. Similarly a study examining the influence of self-talk on physical activity behaviour would be useful, as would a study to determine whether self-talk is reflective of social-cognitions or serves some other separable function. An objective measure of physical activity should also be included in a prospective study to determine if self-talk can impact physical activity behaviour in PR patients. As sustained activity is necessary for maintaining health outcomes of PR, studies should include follow-up times post-PR. It may be informative to include a one-month post-PR follow-up to determine any immediate changes that may occur once removed from the PR setting, and also a 6-month follow-up to see the long term impact of PR on self-talk, and self-talk on physical activity behaviour.

Future research comparing PR patients to other populations would be informative. Comparing healthy aged matched adults to PR patients would provide insight into the impact that respiratory diseases have on self-talk, social-

cognition, and functional exercise capacity relationships and whether gender differences are a result of patient capabilities or if there are inherent differences between male and females in how self-talk is interpreted, and responded to. Gender differences may in part be due to different socialization among males and females. More research should be conducted on understanding the socialization of patients with respiratory disorders. Understanding leisure time beliefs, expectations, and goals of patients upon entering rehabilitation will improve the success of long-term physical activity interventions.

This study suggests that self-talk could be an intervention technique to improve health outcomes and increase physical activity behaviour. It is a simple technique that is inexpensive to administer. The results of this study, along with the previous studies suggest that self-talk interventions may be best used in a self-directed way. To determine the effectiveness of the self-talk intervention, a randomized-controlled trial should be conducted. An objective measure of physical activity, along with health status measures should be collected to determine the impact of the self-talk intervention on these main outcomes. Measures of social-cognitions and self-talk should be obtained as well to provide insight into the mechanisms impacted by the self-talk intervention.

Many future studies on self-talk and exercise could be conducted. Once an exercise self-talk measure is validated, efforts should be made to understand the self-talk, cognition, and behaviour relationships so that effective interventions to improve PR outcomes, as well as increase and sustain physical activity can be implemented.

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Appendix A: Pilot Study Interview Guide

Thank you for agreeing to answer some questions for me today. This interview is part of my Master's research project at the University of Alberta. After my conversation with you and others at the lung centre, I will analyze the data and write a paper about what I find. What you share with me today will help us understand what you think about exercise and how we can help other people that come to the lung centre be more active. The interview should take no more than 30 minutes. If there are some questions during the interview that you don't want to answer that is fine, just let me know and we'll move on. What you say to me today will be anonymous, which means that your name will not be attached to this interview. As well, with your permission, Dr. Stickland will collect some of your health information from your file here at the Centre for Lung Health, such as your age, marital status, smoking history, lung function, exercise capacity, and diagnosis. This information will also be kept anonymous. You have received a consent form. By signing this, you are consenting to this interview as well as giving us permission to access your health information as I have described.

Finally, in order to be as accurate as possible, I would like to record our interview. I'd like to record what you say so I don't miss any of it. I don't want to take the chance of relying on my notes and maybe missing something that you say or inadvertently change your words somehow. Is it ok that I record this interview?

Today I am going to be asking you about exercise. At the lung centre, you are learning how to do different types of exercise, like walking on the treadmill, riding the bike, stretching, using therabands, and lifting weights. When I ask you about exercise, I am talking about these activities that I have mentioned. I'm speaking to you today because I want to understand what sort of statements you say to yourself about exercise and how those statements contribute to whether you exercise or not. For example, when I'm thinking about exercising sometimes I think "I don't really feel like going today, I'll go tomorrow when I'm less busy", and sometimes I think "I can't wait to exercise today! I know it will make me feel great". **I want to emphasize that we are interested in <u>your</u> self-statements and what they mean to <u>you</u>.**

Do you have any questions before we begin?

First I'd like to get an idea of what your experience of exercise has been like.

a) Thinking back throughout your life, what types of exercise have you done? How often did you do each type?
b) What type of exercise do you currently do? How often do you do each type?
    a. Probe: by choice? Because you have to? Where?
c) Has the type of exercise you have done changed since you started coming to the lung centre? How much has the amount of exercise you have done changed since you started coming to the lung centre?
    a. Probe: How much did you used to do? How much now?
d) Has the reason why you exercise changed at all?
    a. Why did you start? Why do you exercise now?

e) Before you started coming to the lung centre, what did you think about exercise? What do you think now? Can you think of any reasons for this change?
f) Can you think of a time when you weren't exercising regularly but knew that you should be?
    a. Probe: What was different about this time? Thinking back, what were your thoughts during this time?

Ok, that's great, thank you. Now can you think back to the days when you first started coming to the lung centre; that first week when you were introduced to all of the exercise equipment.

a) Had you ever used the treadmill, bikes, weights, and therabands before?
b) What were some of the thoughts that were going through your head when you first started using the equipment at the lung centre?
    a. Probe: Do you consider these thoughts to be positive or negative?
    b. What was your reaction to these thoughts?
    c. If your thoughts or reactions had been different, would you still have continued to exercise?
    d. How often do you still have those thoughts while you are exercising?
c) How have your thoughts changed now that you've been exercising for a while?

This is very helpful. Now I want you to think about your exercise habits presently and the thoughts that go through your head while you are exercising.

a) When you are down at the lung centre walking on the treadmill and you are feeling a bit tired. What are some thoughts that might go through your head to help you finish your exercise bout?
    a. Probe: Are these positive or negative thoughts?
b) When you are at the lung centre exercising and you are feeling great, what are some thoughts that might go through your head?
    a. Probe: Are these positive or negative thoughts?

You just spoke about thoughts that you have while exercising. Now I am interested in your thoughts when you are thinking about exercising. Sometimes we may say positive things and sometimes we may say negative things.

a) On a day when you are feeling good and you are getting your stuff together to come down to the lung centre, what are some thoughts that are going through your mind?
    a. Probe: Are these positive or negative thoughts?
b) On a day when you are not feeling very well, maybe you think that you are getting an infection, what are some thoughts that go through your head on these days?
    a. Probe: Are these positive or negative thoughts?
    b. Do you still come down to the lung centre on these days?
    c. Can you think of a specific statement that you say to yourself that helps you exercise on these days when you don't want to?

        i. Probe: Do you consider this a positive or negative statement?

c) Are your thoughts different on the days that you come down to the lung centre from the days that you do not come down to the lung centre?
    a. Can you think of a day when you did not come into the lung centre. What were your thoughts on that day?
        i. Probe: Do you consider this a positive or negative thought?
d) Do you think that saying positive thoughts to yourself help you to exercise?
e) If you thought negatively about exercise, would that influence how much you exercise?

Now I am going to give you some specific examples of some thoughts that you might have when you are thinking about coming into the lung centre and exercising. After I read you the statement, I would like to know how you would respond. (Probe for positive or negative statements/thoughts)

a) Say you are getting ready to go to the lung centre and you think to yourself, "I don't feel like it today." What would you do or think if you said this to yourself?
b) The same scenario, only this time you think to yourself, "Exercising is too difficult for me, I don't want to go anymore." What would you do or think if you said this to yourself?
c) What if you thought to yourself, "I know that I will feel better if I exercise today." What would you do or think if you said this to yourself?

Thank you very much! This has been very helpful so far. I am going to switch things up a bit and ask a few questions about your medication.

a) First off, are you currently taking any medication now? (This can be lung related or not)
b) How long have you been taking your medication for?
c) Would you say that you are pretty good at remembering to take your medication?
d) How do you make sure that you take your medication?
e) Could you give me an example if something that you would say to yourself when you are trying to remember to do something?
f) Do you ever have to remind yourself to exercise?
g) What do you think is different about remember to taking your medication and remembering to exercise?

I just have a few more questions for you today.

a) Overall, would you say that your thoughts about exercise are positive or negative?
b) If you had (opposite to positive or negative thoughts) do you think that would influence whether you exercise or not?
c) Do you think that helping people think more positively about exercise would help them to exercise more often?
d) Has the way you think about exercise changed since you started coming to the lung centre.

e) What do you think would people who attend the The Breathe Easy program continue to exercise once they are done the program?

That is all of the questions that I have for you today. Can you think of anything I should have asked you that I didn't think to ask?
Thank you for your time. Your participation in this interview is very much appreciated.

Appendix B: Pilot Study Informed Consent and Information Sheet

Faculty of Physical Education and Recreation - Informed Consent

Thank you for taking part in this study conducted by Exercise Psychology Laboratory, Faculty of Physical Education and Recreation at the University of Alberta. This study is titled: ***Understanding Internal Dialogue about Exercise***. The principal investigator is Dr. Wendy Rodgers with research assistance from Anne-Marie Selzler. This project is being run with the support of the Centre for Lung Health at the Edmonton General Hospital.

Background: Exercise is an important part of many rehabilitation programs. We are approaching you because you are participating in or have participated in rehabilitation that includes exercise. We are conducting interviews to find out the types of thoughts that people have when considering participating in exercise. The information gathered in this research study will be used to construct a questionnaire to help us measure thoughts about exercise.

Purpose: You are being asked to participate in this research study to help us find out more about what people think when considering participating in exercise.

Interview procedures: If you choose to participate, you will be asked about the types of thoughts that you say to yourself when thinking about exercise, how you react to those thoughts, and other questions about how thoughts about exercise influence your mood. This interview will be audio recorded and take up to 30 minutes to complete. If you don't want to answer any of the questions in the interview, you don't have to, you can just tell us and we'll move on. We will use answers from everyone who responds to make a questionnaire that will help us measure important aspects about people's thoughts in relation to exercise participation. To save you time, with your permission, Dr. Stickland will take some descriptive information including your age, smoking history, last lung function test, last exercise test, and marital status from your patient chart. Providing your written consent gives us permission to access any personally identifiable health information which is under the custody of other health care professionals as deemed necessary for the conduct of this research.

Possible risks and benefits: There are no risks to you from participating in this interview. The benefits to us are that you will help us figure out how to measure people's thoughts about exercise and also how to measure the thoughts that are related to exercise participation with a new questionnaire. Participating in this interview might help you understand how your thoughts are related to your exercise participation. Your participation in this research study will also help us out and hopefully help future rehabilitation program patients.

Confidentiality: All of the information you provide will be held in strict confidence by the researchers. No information will be shared with anyone else. All personal information will be stored in a locked file cabinet in a lab, or on a password protected computer. The information collected from everyone in the study will be presented as a group, so that no one will be identifiable. All identifying information, including names, will be removed immediately after all of the interviews and participant information has been collected and linked together. Normally, data is retained for a period of 5 years post publication, after which it will be destroyed. The

potential outputs of this study include, but are not limited to, publications in professional and applied journals, presentation of information at local, national and international conferences, and workshops presented to health practitioners interested in the promotion of exercise. By signing the consent form you give permission to the study staff to access any personally identifiable health information which is under the custody of other health care professionals as deemed necessary for the conduct of the research.

Freedom to withdraw: If at any time during the interview you would like to withdraw, simply inform the researcher and your information will be removed from the study upon your request. There will be no consequences if you choose to withdraw from this research study.

Additional Contacts: If you have any questions about this project you can contact any of the researchers listed above. If you would like to talk to someone who has no direct involvement of the project, you can contact the University of Alberta Research Ethics Office at 780-492-2615. This project was approved by Health Research Ethics Panel at the University of Alberta.

Thank you for your consideration,

Wendy M. Rodgers, Ph.D.
Professor of the Faculty of Physical Education and Recreation
780-492-2677

Anne-Marie Selzler, B.Sc. (Hons)
Master Student of the Faculty of Physical Education and Recreation
780-492-7424

Faculty of Physical Education and Recreation

Consent Form

Title of Project: Understanding Internal Dialogue about Exercise

Principal Investigator: Dr. Wendy Rodgers, Ph.D.
Faculty of Physical Education and Recreation, University of Alberta,
(780)-492-2677
wendy.rodgers@ualberta.ca

Co-Investigators: Anne-Marie Selzler, B.Sc. (Hons), University of Alberta, 492-7424
Tanya Berry, Ph.D., University of Alberta, 492-3280
Michael Stickland, Ph.D. University of Alberta, Caritas Lung Centre, 407-7845

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?	Yes	No
Has the issue of confidentiality been explained to you? Do you understand who will have access to your records, including personally identifiable health information?	Yes	No

This study was explained to me by: _____

I agree to take part in this study:

_____ _____

Signature of Research Participant Date Witness

_____ _____

Printed Name Printed Name

I believe the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____ _____

Signature of Investigator or Designee Date

Appendix C: Operational Definitions of Self-talk Categories

Self-efficacy in self-talk

Self-efficacy in self-talk refers to the language used by a person that states their confidence or belief in their abilities to carry out an exercise task. High self-efficacious self-talk is evident in words that indicate the person "can" or possibly "will" be able to do the exercise task. Likewise, low self-efficacious self-talk is evident in words that indicate the person "cannot" or possibly "will not" be able to do the exercise task.

Perceived difficulty in self-talk

Perceived difficulty in self-talk refers to the language used by a person that states whether they judge the exercise task to be difficult or not. In high perceived difficulty self-talk, words or statements are used that indicate that the person judges the exercise task to be "challenging", "hard", "difficult", or "too much" for them to handle. In low perceived difficulty self-talk, words or statements about exercise, such as "easy" or "not difficult enough" are used.

Perceived severity in self-talk

Perceived severity in self-talk refers to the language used by a person that states whether the person considers their illness or symptoms of their illness to be severe. In high perceived severity self-talk, words are used that indicate the condition of the person's disease is grave, or the symptoms associated with their disease are

serious. For example, statements such as “I can’t breathe very well” may be used. Correspondingly, in low perceived severity self-talk, words that indicate the condition of the person’s disease is “good” or “manageable” or that their symptoms are “not that bad” or “manageable” are used.

Instrumental attitudes in self-talk

Instrumental attitudes in self-talk refers to the language used by a person that states whether the person considers exercise to be advantageous or disadvantageous. Positive instrumental attitudes in self-talk is evident in words that affirm that exercise is advantageous, and describe exercise as “helpful”, “useful”, or “beneficial”. On the other hand, negative instrumental attitudes in self-talk is evident in words or phrases that state exercise is disadvantageous. For example, words are used that state that exercise is “not helpful”, “useless”, and/or “harmful”.

Affective attitudes in self-talk

Affective attitudes in self-talk refers to the language used by a person that states whether the person considers exercise to be associated with an emotional state. For positive affective attitudes in self-talk, words are used that describe exercise related tasks in a positive emotional way. Words such as “fun”, or “enjoyable” are used. For negative affective attitudes in self-talk, words are used that describe exercise in a negative emotional way. For example

words will be used that describe exercise as “boring”, or “unenjoyable”.

Barriers in self talk

Barriers in self-talk refers to the language used by a person that states reasons why they do not exercise. High perceived barriers in self-talk will is evident when people say to themselves the reasons why they do not exercise, such as “I’m too tired”, “I don’t feel like it”, or “I don’t want to”.

Persistence in self-talk

Persistence in self-talk refers to the language used by a person that states whether they desire to continue or discontinue exercise (similar to encouragement). In high persistent self-talk, words or phrases are used that indicate the person wants to continue to exercise and keep trying. For example phrases such as “Just do it” and “A little bit at a time”, are used. Similarly, in low persistent self-talk, words or phrases are used that indicated that the person wants to discontinue exercise, or stop trying. An example phrase is, “I think I’ll stop trying”.

Personal physical evaluation in self-talk

Personal physical evaluation in self-talk refers to the language used by a person that states their opinion of their physical body. Someone who has positive physical evaluation self-talk will frequently say phrases about their physical body that are favorable,

such as, “I feel strong”. Someone who has negative physical evaluation self-talk will frequently say phrases about their physical body that are unfavorable, such as, “my body is not in good condition”, or “I’m not in very good shape”.

Personal pressure in self-talk

Personal pressure in self-talk refers to the language used by a person that states that they feel obligated to perform some aspect of exercise (similar to introjected or external regulation from self-determination theory). In high personal pressure self-talk, words are used that indicate their obligation to exercise, such as, “need”, “must”, “should”, or “have to”.

Reassurance in self-talk

Reassurance in self-talk refers to the language used by a person that is used as means of personal support that affirms that they will be able to successfully complete their exercise task. In high reassurance self-talk, words or statements that assure the person that they are on track are used; for example “I can make it” and “I’m going to be fine”.

Appendix D: Exercise Self-Talk Questionnaire

Listed below are a variety of statements that people may say to themselves (either silently or out loud) when they are exercising or thinking about exercising. When you think of exercise, think of **what you have been advised to do at the Lung Centre**.

Please read each item and respond to the questions listed below.

I can do this

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I'm not in very good shape

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I can make it

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

A little bit at a time

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I should do more

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

Exercise is too difficult

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I can't breathe very well

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

Just do it

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

My body is not in good condition

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I need to work harder

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

Exercise is helping me feel better

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I think I'll stop trying

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

Exercise isn't so bad

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

Just a little bit longer

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I don't feel like it

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I have to keep trying

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I don't think I can do this

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I'm going to be fine

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

Exercise is easy

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I'm going to do it even though I don't feel like it

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I feel strong

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

I have to do it

How often do you say this statement to yourself about exercise?

1	2	3	4	5	6	7
Never	Rarely		Sometimes		Often	Very often

Does this statement make you want to exercise more or less?

1	2	3	4	5	6	7
Much Less			Neither more or less			Much More

Appendix E: St. George's Respiratory Questionnaire

Centre for Lung Health

St. George's Quality of Life Questionnaire

About the Questionnaire

1.These questions are to help us understand how your **BREATHING PROBLEMS** may affect your life and if our program helps you.

2. Please read the questions carefully. Ask if you do not understand.

3. Written comments are not required. Do not write **"sometimes"**. Mark **"true"** if your answer is **"sometimes"**.

4.There is no right or wrong answer. Simply answer how you feel.

5. If you are with someone, do not let them answer for you.

6. You must answer every question unless it instructs you to go to the next one.

NAME _____ **DATE** _____

FOR OFFICE USE ONLY

Program Date and Class Number _____

Checker's Initial ____

- ☐ Pre
- ☐ Post
- ☐ Six Month Follow Up
- ☐ One Year Follow Up
- ☐ Two Year Follow Up

Part 1

Questions about how many breathing problems you have had over the last year. Please check one box for each question.

	most days a week	several days a week	a few days a week	only with chest infections	not at all	
1 Over the last year, I have coughed	☐	☐	☐	☐	☐	1
2 Over the last year, I have coughed up phlegm (sputum):	☐	☐	☐	☐	☐	2
3 Over the last year, I have had shortness of breath:	☐	☐	☐	☐	☐	3
4 Over the last year, I have had attacks of wheezing:	☐	☐	☐	☐	☐	4

5 If you have a wheeze, is it worse in the morning? (If you do not have a wheeze, answer no.)	no	☐	5
	yes	☐	
6 During the past year, how many severe or very unpleasant episodes of breathing problems have you had?	more than 3 times	☐	6
	3 times	☐	
	2 times.....	☐	
	once	☐	
(Go to question 8 if you had no severe episodes)	none	☐	
7 How long did your worst episode last?	a week or more	☐	7
	3 or more days	☐	
	1 or 2 days	☐	
	less than a day	☐	
8 Over the past year, in an average week, how many good days (with few breathing problems) have you had?	no good days	☐	8
	1 or 2 good days ...	☐	
	3 or 4 good days ...	☐	
	nearly every day is good	☐	
	every day is good ...	☐	

Part 2

Section 1

How would you describe your breathing problem? (Please check one box only)

the most important problem I have	☐	1
causes me quite a lot of problems	☐	
causes me a few problems	☐	
causes no problem	☐	

If you have ever been employed or are now employed, please check one of these:

my breathing problem made me stop work	☐	2
my breathing problem interferes with my work or required me to change my work	☐	
my breathing problem does/did not affect my work	☐	
have never been employed	☐	

Section 2: Questions about what activities usually make you feel breathless **these days.** For each item, please check either true or false as it applies to you.

	True	False	
Sitting or lying still	☐	☐	1
Getting washed or dressed	☐	☐	2
Walking inside your home	☐	☐	3
Walking outside on level ground	☐	☐	4
Walking up a flight of stairs	☐	☐	5
Walking hills	☐	☐	6
Playing sports or active games (ie. golfing, bowling, dancing)	☐	☐	7

Section 3: Questions about your cough and breathlessness **these days**. For each item, please check either true or false as it applies to you.

	True	False	
My cough hurts	☐	☐	1
My cough makes me tired	☐	☐	2
I am breathless when I talk	☐	☐	3
I am breathless when I bend over	☐	☐	4
My cough or breathing disturbs my sleep	☐	☐	5
I become exhausted easily	☐	☐	6

Section 4: Questions about other effects that your breathing problem may have **these days**: For each item, please check either true or false as it applies to you.

	True	False	
My cough or breathing is embarrassing in public	☐	☐	1
My breathing problem is a nuisance to my family, friends or neighbors	☐	☐	2
I become afraid or I panic when I cannot get my breath	☐	☐	3
I feel that I am not in control of my breathing problem	☐	☐	4
I do not expect my breathing problem to get any better	☐	☐	5
I have become frail or an invalid because of my breathing problem	☐	☐	6
Exercise is not safe for me	☐	☐	7
Everything seems to take too much effort	☐	☐	8

Section 5: Questions about your breathing medication. If you are not prescribed breathing medication, including oxygen, go straight to **Section 6**. To complete this section please check either true or false as it applies to you.

	True	False	
My medication does not help me very much	☐	☐	1
I am embarrassed using my medication in public	☐	☐	2
I have unpleasant side effects from my medication	☐	☐	3
My medication interferes with my life a lot	☐	☐	4

Section 6: Questions about how your activities might be affected **by your breathing**. If you do not do an activity, would your breathing allow you to do it? For each question, please check true if one or more activity applies to you. Otherwise check false.

	True	False	
I take a long time to get washed or dressed	☐	☐	1
I cannot take a bath or shower, or I take a long time	☐	☐	2
I walk slower than other people, or I stop for rests	☐	☐	3
Jobs such as housework take a long time, or I have to stop for rests	☐	☐	4
If I walk up one flight of stairs, I have to go slowly or stop	☐	☐	5
If I hurry or walk fast, I have to stop or slow down	☐	☐	6
My breathing makes it difficult to do things such as walking up hills, carrying things up stairs, light gardening, dancing, bowling or golfing	☐	☐	7
My breathing makes it difficult to do things such as carry heavy loads, dig the garden or shovel snow, jog, play tennis or swim	☐	☐	8
My breathing makes it difficult to do things such as very heavy manual work, run, cycle, swim fast or play competitive sports	☐	☐	9

Section 7: We would like to know how your breathing problem **usually** affects your daily life.
Please check either true or false as it applies to you **because of your breathing problem**. Remember that **true** only applies to you if you cannot do something **because of your breathing**.

	True	False	
I cannot play sports or games	☐	☐	1
I cannot go out for entertainment or recreation	☐	☐	2
I cannot go out of the house to do the shopping	☐	☐	3
I cannot do the housework	☐	☐	4
I cannot move far from my bed or chair	☐	☐	5

Appendix F: The Self-Talk Function Scale (STS)

Researchers have determined that all people talk to themselves, at least in some situations or under certain circumstances. Each of the following items concerns those times when you might "talk to yourself" or carry on an internal conversation with yourself (either silently or out loud).

Please indicate how true each item is for you personally by circling the appropriate number next to each item. Assume that each item begins with the statement: "I talk to myself when…" Be sure to rate each item. Please take your time and think carefully about each item. Use the following scale to rate each item:

1 2 3 4 5

Never Rarely Sometimes Often Very often

I TALK TO MYSELF WHEN	**Never**				**Very often**
1. I should have done something differently	1	2	3	4	5
2. Something good has happened to me	1	2	3	4	5
3. I need to figure out what I should do or say	1	2	3	4	5
4. I'm imagining how other people respond to things I've said	1	2	3	4	5
5. I am really happy for myself	1	2	3	4	5
6. I want to analyze something that someone recently said to me	1	2	3	4	5
7. I feel ashamed of something I've done	1	2	3	4	5
8. I'm proud of something I've done	1	2	3	4	5
9. I'm mentally exploring a possible course of action	1	2	3	4	5
10. I'm really upset with myself	1	2	3	4	5
11. I try to anticipate what someone will say and how I'll respond to him or her	1	2	3	4	5
12. I've giving myself instructions or directions about what I should do or say	1	2	3	4	5
13. I want to reinforce myself for doing well	1	2	3	4	5
14. Something bad has happened to me	1	2	3	4	5
15. I want to remind myself of what I need to do	1	2	3	4	5
16. I want to replay something that I've said to another person	1	2	3	4	5

Appendix G: Social-Cognitive Questionnaire

The following questions ask about your thoughts regarding exercise. Exercise refers to at least 30 minutes of the things you do at the lung centre (e.g., walk on a treadmill, ride a bike, use weights and therabands).

During a typical week (7 days), how many times on average do **YOU** do the following kinds of exercise for at least 30 minutes during your free time? **(Write the appropriate number in each box for each level of intensity)**

Intensity of the activity	**Times per week**
Mild (minimal effort, no perspiration) Examples: yoga, fishing, bowling, horseshoes, golf	
Moderate (not exhausting, light perspiration) Examples: fast walking, dancing, easy swimming, badminton, easy bicycling	
Strenuous (heart beats rapidly, sweating) Examples: running or jogging, vigorous swimming, vigorous aerobic classes, heavy weight training	

How often in the next 7 days do you intend to engage in a structured exercise session **at the lung centre** (e.g, walk on the treadmill, ride a bike, use weights and therabands)? One exercise session equals a total of 30 minutes.

Zero times _____

Once _____

Twice _____

Three times _____

More than three _____

How often in the next 7 days do you intend to engage in a structured exercise session **outside the lung centre.** That is, do you intend to do any exercise sessions **on your own**, where you go for a walk (maybe on a treadmill) and do other exercises? One exercise session equals a total of 30 minutes.

Zero times _____

Once _____

Twice _____

Three times _____

More than three _____

Please indicate HOW CONFIDENT YOU ARE THAT YOU CAN PERFORM each of the exercise related tasks below.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No confidence								Complete Confidence		
How confident are you that you can…										
Perform all of the movements required for your exercises										%
Do your exercises when they cause some discomfort										%
Include your exercise sessions in your daily routine										%

Please indicate how much you agree with the statements below.

My COPD is severe

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **HELPFUL**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **HARMFUL**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **NOT HELPFUL**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **BENEFICIAL**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **ENJOYABLE**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **BORING**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **FUN**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **UNENJOYABLE**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is **difficult.**

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

For me, exercising at least 2 or 3 days a week is <u>not</u> something I feel like doing.

1	2	3	4	5	6	7
Strongly agree						Strongly disagree

Appendix H: Main Study Information Letter and Consent Form

Faculty of Physical Education and Recreation - Informed Consent

Thank you for taking part in this study conducted by the Exercise Psychology Laboratory, Faculty of Physical Education and Recreation at the University of Alberta. This study is titled: ***Self-talk about Exercise in People with Respiratory Disorders***. The principal investigator is Dr. Wendy Rodgers with research assistance from Anne-Marie Selzler. This project is being run with the support of the Centre for Lung Health at the Edmonton General Hospital.

Background: For people with COPD, exercise is an important part of pulmonary rehabilitation. We are approaching you because you are participating in pulmonary rehabilitation that includes exercise. We are distributing surveys to find out the types of thoughts that people with COPD have about exercise and how those thoughts are related to exercise and quality of life improvements achieved in pulmonary rehabilitation.

Purpose: You are being asked to participate in this study to help us find out more about what people think about exercise and how those thoughts influence exercise and quality of life improvements.

Interview procedures: If you choose to participate, you will be asked to fill out questionnaires that ask about your thoughts about exercise. In total, the questionnaires will take up to 20 minutes to complete. If you don't want to answer any of the questions in the questionnaires, you don't have to; you can just leave your answer blank. To save you time, with your permission, Dr. Stickland will take some information from your patient chart, including your age, smoking history, last lung function test, last exercise test, quality of life scores, and marital status. Providing your signature on this form gives us permission to access any personally identifiable health information which is under the care of other health care professionals as considered necessary to carry out this research.

Possible risks and benefits: There are no risks to you from participating in this study. The benefits to us are that you will help us figure out how thoughts about exercise are related to improvements in exercise and quality of life achieved with rehabilitation. Participating in this study might help you understand how you think about exercise and how what you think influences what you do. Your participation in this study will also help us out and hopefully help other rehabilitation patients in exercise programs.

Confidentiality: All of the information you provide will be held in strict confidence by the researchers. No information will be shared with anyone else. All personal information will be stored in a locked file cabinet in a lab, or on a password protected computer. The information collected from everyone in the study will be presented as a group, so that no one will be identifiable. All identifying information, including names, will be removed immediately after all of the questionnaires and information has been collected and linked together. Normally, data is kept for 5 years after publication, after which it will be destroyed. The results of this study may be used for, but is not limited to, publications in professional and applied journals, presentation of information at local, national and international conferences, and workshops presented to

health care workers interested in the promotion of exercise. By signing the consent form you give permission to the study staff to access any personally identifiable health information which is under the care of other health care professionals as considered necessary to carry out this research.

Freedom to withdraw: If at any time during the study you would like to withdraw, simply inform the researcher and your information will be removed from the study upon your request. There will be no consequences if you choose to withdraw from this study.

Additional Contacts: If you have any questions about this project you can contact any of the researchers listed below. If you would like to talk to someone who has no direct involvement of the project, you can contact the University of Alberta Research Ethics Office at 780-492-2615. This project was approved by Health Research Ethics Panel at the University of Alberta.

Thank you for your consideration,

Wendy M. Rodgers, Ph.D.
Professor of the Faculty of Physical Education and Recreation
780-492-2677

Anne-Marie Selzler, B.Sc. (Hons)
Master Student of the Faculty of Physical Education and Recreation
780-492-7424

Faculty of Physical Education and Recreation

Consent Form

Title of Project: Self-talk about Exercise in People with Respiratory Disorders

Principal Investigator: Dr. Wendy Rodgers, Ph.D.
Faculty of Physical Education and Recreation, University of Alberta,
(780)-492-2677
wendy.rodgers@ualberta.ca

Co-Investigators: Anne-Marie Selzler, B.Sc. (Hons), University of Alberta, 492-7424
Tanya Berry, Ph.D., University of Alberta, 492-3280
Michael Stickland, Ph.D. University of Alberta, Caritas Lung Centre, 407-7845

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?	Yes	No
Has the issue of confidentiality been explained to you? Do you understand who will have access to your records, including personally identifiable health information?	Yes	No

This study was explained to me by: _____

I agree to take part in this study:

_____ _____

Signature of Research Participant Date Witness

_____ _____

Printed Name Printed Name

I believe the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____ _____

Signature of Investigator or Designee Date