THE ROLE OF ILLNESS PERCEPTIONS IN RELATION TO DEPRESSION SYMPTOMS AND FUNCTIONAL PERFORMANCE IN PATIENTS WITH HEART FAILURE

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ABSTRACT

Background: Congestive heart failure (CHF) and depression, two leading problems in the community, are independently known to result in significant functional impairments, deterioration in quality of life and high mortality. While depression has been found to be a significant predictor of cardiac events and cardiac mortality, the importance of concurrent depression in patients with CHF has only recently been addressed. Studies of adjustment to chronic illnesses suggest that patients' beliefs about their illness or illness perceptions are important factors that may not only explain variations in patients' response to the same level of disease severity but may also influence more directly patients'outcomes such as adherence to treatment regimen, psychological and physical outcomes.

Objectives: The objectives of this study were to assess the relationships between six dimensions of illness perceptions (*Identity*, *Timeline*, *Consequences*, *Personal Control*, *Treatment Control* and *Coherence*), and later measures of depression symptoms and functional performance in patients with CHF, and to explore the moderating effect of social support in the relationships between illness perceptions and later depression symptoms and functional performance.

Methods: A longitudinal study was conducted on 142 ambulatory CHF patients treated at the Heart Failure Clinic at the Montreal Heart Institute. Patients included in the study had left ventricular ejection fraction (LVEF) of less than 40% and were able to speak and read French or English. Baseline assessment included depressive symptoms (Cardiac Depression Scale, CDS), functional performance, (Functional Performance Inventory, FPI-SF), illness perceptions (Revised Illness Perceptions Questionnaire, IPQ-R), and social support (Interpersonal Relationship Inventory, IPRI). Four-month telephone follow-up included assessment of depressive symptoms and functional performance.

Results: The prevalence of depressive symptoms was high, with 46.3% (n=136) of the sample reporting depressive symptoms, 27.9% moderately severe depression and 18.4% severe depression. After controlling for age, sex, education, living alone, LVEF, and

comorbidity, patients who reported a greater number of symptoms identified with heart failure label (*Identity*), more serious *Consequences*, longer illness duration (*Timeline*), weaker beliefs about *Personal Control* and the effectiveness of *Treatment Control*, and lower understanding of their illness (*Coherence*), reported significantly higher levels of depression symptoms and lower functional performance. In the longitudinal analyses, after controlling for baseline depression, beliefs about *Treatment Control* at baseline explained significant additional variance in depression at follow-up ($p<.01$). Weaker beliefs about *Personal Control* were significantly associated with higher depression symptoms and worse functioning at lower levels of social support, but these relationships were not apparent at higher levels of social support.

Conclusions: Depression was highly prevalent in this sample of outpatients with CHF, confirming the need for improved recognition of depression in this group. Patients' beliefs about their illness appear to be particularly relevant in patients adjusting to CHF. Interventions that modify or take into account patients' negative beliefs about illness may have the potential to influence behaviour and reduce depression symptoms in CHF.

RÉSUMÉ

Contexte : L'insuffisance cardiaque et la dépression constituent deux problèmes de taille au sein de la société, qui engendrent d'importantes limites fonctionnelles, une détérioration de la qualité de vie, ainsi qu'un taux de mortalité élevé. Bien que la dépression ait été associée à un risque accru d'événements cardiaques et de mortalité chez les patients atteints de maladie cardiaque, peu d'études ont exploré l'importance de la dépression chez des patients atteints d'insuffisance cardiaque. Certaines études portant sur l'ajustement aux maladies chroniques suggèrent que la perception qu'a le patient de sa maladie est un facteur qui pourrait expliquer, non seulement les variations dans les réponses adaptatives des patients atteints d'une même maladie à sévérité égale, mais encore plus directement des indicateurs de comportements de santé psychologiques et physiques, tel que l'adhérence aux médicaments.

Objectifs : Le but de cette étude était d'évaluer les relations possibles entre six dimensions de la perception de la maladie (*Identité*, la *Durée*, les *Conséquences*, le *Contrôle Personnel*, le *Contrôle des Traitements*, et la *Compréhension*), en lien avec la dépression et la performance fonctionnelle chez des patients atteints d'insuffisance cardiaque, et d'explorer l'effet de modification du soutien social dans ces relations.

Méthode: Une étude longitudinale a été effectuée auprès de 142 patients suivis à la clinique d'insuffisance de l'Institut de cardiologie de Montréal, qui présentaient une fraction d'éjection ventriculaire gauche inférieure à 40%, et étaient aptes à parler et comprendre le français ou l'anglais. L'évaluation psychosociale initiale comprenait les symptômes de la dépression (Cardiac Depression Scale, CDS), le statut fonctionnel (Functional Performance Inventory, FPI-SF), les perceptions de la maladie (Revised Illness Perceptions Questionnaire, IPQ-R), de même que le soutien social (Interpersonal Relationship Inventory, IPRI). Le suivit téléphonique à quatre mois comprenait l'évaluation des symptômes de la dépression et du statut fonctionnel.

Résultats: La prévalence des symptômes de la dépression était particulièrement élevée; 46.3% (n=136) des patients présentaient des symptômes de depression, soit 27.9% des symptômes de dépression modérérés à sévères et 18.4% des symptômes de dépression sévère. Des analyses de régression linéaires ont demontré que les scores élevés de dépression au suivi à quatre mois étaient associés de façon significative à un plus grand nombre de symptômes identifiés par le patient comme étant en lien avec sa maladie (*Identité*), à une perception plus longue en regard de la *Durée* de sa maladie, à des *Conséquences* plus importantes de sa maladie, à une plus faible perception de *Contrôle Personnel* et de *Contrôle des Traitements*, ainsi qu'à une moins bonne *Compréhension* de sa maladie, après avoir ajusté pour des caractéristiques démographiques et cliniques tels que l'age, le sexe, l'éducation, le fait de vivre seul, la fraction d'éjection ventriculaire gauche et la comorbidité. Les résultats ont également indiqué que la performance fonctionelle était associée à la plupart de ces dimensions. Les analyses longitudinales ont indiqué qu'après avoir ajusté pour le score initial de dépression, la perception du *Contrôle des Traitements* permettait de prédire la dépression au suivi à quatres mois. Une perception de *Contrôle Personnel* limitée était associée à un plus haut niveau de dépression et à une performance fonctionnelle réduite, chez les patients qui rapportaient un plus bas niveau de soutien social, alors que ces relations n'étaient pas manifestes à des niveaux plus élevés de soutien social.

Concusions: La forte prévalence des symptômes de la dépression identifiée dans cette étude confirme l'importance d'ameliorer la reconnaissance des symptomes de la dépression chez les patients atteints d'insuffisance cardiaque. Les résultats soulignent la pertinence de valider la perception de la maladie chez les patients atteints d'insuffisance cardiaque. Des interventions qui modifieraient les perceptions négatives pourraient contribuer à améliorer la performance fonctionnelle et à atténuer les symptômes de la dépression chez les patients atteints d'insuffisance cardiaque.

STATEMENT OF ORIGINALITY

This thesis represents original research. A longitudinal study was conducted on 142 ambulatory patients with CHF treated at the Heart Failure Clinic at the Montreal Heart Institute. The study objectives were developed and specific analytic strategies were planned. The objectives were to examine the interrelationships among six dimensions of patients' subjective views of their illness, social support, and later measures of depression symptoms and functional performance in patients with CHF. The investigator recruited the patients and conducted the baseline and follow-up psychosocial interviews.

This study extends work regarding psychosocial correlates of depression and physical health outcomes. It provides a better understanding of patients' beliefs of their illness as potentially modifiable factors influencing depression and functional performance, and provides theoretical grounds for guiding research in heart failure.

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CHAPTER 1. INTRODUCTION

Congestive heart failure (CHF) and depression, two leading problems in the community, are independently known to result in significant functional impairments, deterioration in quality of life and high mortality. CHF is the final manifestation of many heart diseases. It is increasing in incidence and prevalence worldwide,[1,2,3] and these increases are likely to continue as a result of the aging of the population and advances in lifesaving cardiovascular therapies.[4,5] Likewise, depression is the most commonly reported psychiatric illness, [6-8, 9] with established high prevalence in cardiac patient samples,[10,11] and it has been identified as the leading cause of disability worldwide with regard to years lived with disability, and the leading cause of the overall burden of illness by 2020. [12]

CHF and depression are also known to impose a large burden of morbidity, as well as high mortality. CHF is the leading cause of hospitalization in adults over 65 years of age, and the most common principal discharge diagnosis among all hospitalized patients. [13,14] The high rates of readmission associated with CHF[15] highlight the vulnerability of CHF patients to recurrent exacerbations of this illness, in addition to a high death rate. [15,16] Depression is similarly associated with increased health care utilization and increased health care costs among community residents,[9,17] medical populations,[18] and among patients with cardiovascular disease (CVD).[19]

As depression was found to be a strong predictor of cardiac events,[20-22] of cardiac mortality,[10,23,24] and a predictor for the development of cardiovascular disease,[25,26] the

importance of concurrent depression in patients with CHF has only recently been addressed.

Recent studies of depression in CHF patients showed that depression is highly prevalent, it is at least as high as the prevalence estimates found in other cardiac patient samples, and some studies have provided epidemiologic evidence of the prognostic implications of depression in this group.[27,28] In patients with CHF, depression is also associated with higher rates of hospitalization,[28] declines in functioning,[29] and also with increases mortality.[30] Although there are suggestions in the literature that depression may be highly prevalent in CHF patients and may be important in heart failure prognosis, there is a paucity of data on its role and how it relates to other determinants of physical functioning outcomes in CHF patients.

Studies on the risk factors of depression and studies on the determinants of functional status involving patients with chronic illnesses, have reported an etiologic role for demographic and social support factors,[31,32] and for objective measures of disease severity such as comorbidity, in both depression and functional status outcomes.[33-35] Recently, the role of patients' subjective views of their illness, or illness perceptions, has been increasingly studied in patients with various chronic illnesses, and findings suggest that illness perceptions are important factors contributing to medical, social, and psychological outcomes including depression. Illness perceptions, as defined in Leventhal's self-regulatory model,[36,37] represent patients' subjective views about their illness, or internal representations of the external world. These perceptions provide a framework for patients to understand their illness, assess health risk, and guide their health behaviors. In

fact, it has been suggested that these perceptions possibly explain variations in patients' adjustment to the same level of disease severity. Illness perceptions include: 1) *Identity*, beliefs about the signs and symptoms associated with the illness; 2) *Timeline*, beliefs about duration of the illness; 3) *Consequences*, beliefs about the severity of the illness; 4) *Personal Control* and 5) *Treatment Control*, beliefs about personal control and about the effectiveness of treatment control; and 6) *Coherence* or understanding of the illness.

Some cross-sectional studies[38-40]and a few longitudinal studies[41-43] in patients with different chronic illnesses such as chronic obstructive pulmonary disease, rheumatoid arthritis (RA), and psoriasis, provide empirical support for the central role of illness perceptions in directing health-protective behavior and in predicting both physical and psychological outcomes, including depression. For example in one such study, in patients with psoriasis,[43] beliefs in adverse consequences of the disease and less perceived control over the course of the illness were associated with increased health care utilization and hospital admission over the study follow-up, after statistically controlling for the effects of medical variables.

In cardiac patients, illness perceptions were significantly associated with attendance at rehabilitation program, speed of return to work and health behavior changes, following an acute myocardial infarction or after a cardiac surgery. [44-46] To the author's knowledge, the present study is the first, conducted in patients with CHF, to specifically examine illness perceptions using Leventhal's self-regulatory model. Beliefs about the course of their illness (*Timeline*), beliefs about *Personal Control* and the effectiveness of *Treatment Control*, and patients' *Coherent* understanding of their illness, may be particularly relevant

to the experience of heart failure, given the need for patients to continuously monitor their symptoms, control dietary and fluid intake, and adhere to complex medical regimens. In this context, an illness perception approach to the problems of CHF and depression may offer unique opportunities to identify relevant aspects of patients' adjustment, in the aim of improving functioning and alleviating depression symptoms.

CHAPTER 2. BACKGROUND AND LITERATURE REVIEW

This chapter is organized into eight sections. The first, on congestive heart failure (CHF), defines heart failure, reviews epidemiologic data on the prevalence and incidence of CHF, its prognosis and correlates. The second section, on depression, defines major depression and more minor or subsyndromal forms of depression as diagnostic categories, and also examines the literature on depression as a continuum of symptoms. It then describes the prevalence of depression among community dwellers, and cardiac patients, and reviews the prevalence of depression in patients with three commonly reported chronic conditions, namely stroke, RA and cancer. Finally, it explores the correlates of depression and its associated morbidity and mortality. The third section, on illness perceptions, reviews the literature that has explored this concept in relation to depression and functional status. The fourth and fifth sections review the literature on social support and functional performance, as they relate to depression and chronic illnesses. Lastly, the sixth section presents the conceptual framework used in the present study, and sections seven and eight present the objectives and the study hypotheses.

2.1 CONGESTIVE HEART FAILURE

2.1.1 DEFINITION

Congestive heart failure (CHF), the final manifestation of many heart diseases, is a chronic condition characterized by fatigue, dyspnea, and progressive limitations in functional status leading to forced dependency. Heart failure is defined in the medical literature as "the pathophysiological state in which the heart is unable to pump blood at a

rate commensurate with the requirements of the metabolizing tissues or can do so only from an elevated filling pressure" (Braunwald et al., 1997, p.394).[47] Heart failure is recognized clinically by a constellation of signs and symptoms that are the result of compensatory mechanisms for cardiac dysfunction. Severe heart failure will typically include symptoms such as peripheral edema, dyspnea, orthopnea, paroxysmal nocturnal dyspnea, fluid retention, and acute pulmonary edema. Less severe heart failure may be asymptomatic at rest and have only modest limitations in activities.[48] Heart failure may occur as the end-result of damage caused by a number of disease processes e.g. hypertension, valvular defects, and congenital heart disease, but the most common etiology of heart failure is ischemic heart disease.

2.1.2 PREVALENCE AND INCIDENCE OF CHF

CHF is a major cardiovascular problem that is increasing in incidence and prevalence worldwide,[1] as a result of the progressive aging of the population,[4] and the increasing proportion of post-myocardial infarction (MI) patients who survive.[5] In an extensive literature review of US and European studies from 1966 to 1995, Cowie et al. (1997)[2] reported prevalence estimates for heart failure ranging from 0.3% to 2.0%, to as high as 13.0% for those aged over 65 years. Recently, a community-based study in the US reported an overall prevalence of CHF of 2.2%, for which 0.7% was diagnosed among participants aged 45 through 54, 1.3% for those aged 55 through 64, 1.5% for those aged 65 through 74, and 8.4% for those greater than 75 years.[3]

The incidence of CHF is three times greater in men than in women, and increases markedly with increasing age. In a community-based elderly sample in the US who were free of heart failure in 1982 and followed over a 10-year period, Chen and al. (1999)[49] reported an overall incidence of heart failure of 12.5 per thousand per annum. The incidence ranged from 12.5 to 29.3 for men, and from 8.1 to 18.4 per thousand per annum for women, varying according to the different age groups. The higher incidence of heart failure and reduced survival in men than in women in every age group[1,50] result in a prevalence figure that is about the same for men and women.[51]

The diagnosis of CHF is now made at a later age. The Framingham Study reported that subjects were older at the time of diagnosis of heart failure over the various waves of the study. The mean age at diagnosis was 57.3 in the 1950s, 65.9 in the 1960s, 71.6 in the 1970s, and 76.4 years in the 1980s.[52,53]

2.1.3 PROGNOSIS OF CHF

CHF is associated with very high mortality and morbidity. Population-based studies report 6-month and 1-year mortality rates ranging from 15% to 30%, and from 23% to 43% respectively, and increasing mortality rates with advancing age.[52,54,55] Hospital-based studies of patients with decompensated CHF report 6-month and 1-year mortality rates ranging from 21% to 44% and from 29% to 52% [13,16,56-58] Statistics from the Heart and Stroke Foundation of Canada[15] indicate that both the death rates and the hospitalization rates for CHF increased between 1985 and 1995, and that they then stabilized in the later

1990s, but projections to 2025 suggest that they will increase sharply for both men and women due to the aging of the population.

Mortality rates for men exceed those for women.[16,52 59,50] Evidence for sex differences in the primary etiology of heart failure and clinical expression of heart failure have been suggested to explain these differences in mortality rates observed between sexes. Women are more likely to have hypertension as the primary etiology of heart failure. Men on the other hand, more often have ischemic heart disease.

2.1.4 HOSPITAL MORBIDITY

CHF is the leading cause of hospitalization in adults over the age of 65 years,[60] as well as the most common principal discharge diagnosis among all hospitalized patients. Readmission within 3 to 6 months of initial discharge has been reported to occur in 24 to 52% of cases [13,14,16,61,62] Brophy et al. (1993)[58] reported a 6-month readmission rate of 30% among patients hospitalized for CHF at two general hospitals in Canada. The high rates of readmission in these studies highlight the vulnerability of CHF patients to recurrent illness and their large burden of morbidity. Noncardiac comorbidities are also highly prevalent in patients with CHF and are associated with increases in preventable hospitalizations. Braunstein and colleagues (2003)[63] determined that among 122,630 individuals $\geq$ 65 years old with CHF, nearly 40% had five or more noncardiac comorbidities, and this group accounted for 81% of the total inpatient hospital days.

Some studies have sought to identify risk factors that contribute to early readmission among patients hospitalized with heart failure. In a prospective study of 257

patients admitted nonelectively with heart failure in 1993 and 1994 to an urban hospital in the U.S., Chin and colleagues (1997)[64] found both medical and social factors (such as single marital status) to be independent correlates of readmission or death. Others have found a failed social support system[62] and lack of adherence to the medical regimen [65,66] to be important factors for readmission. In a literature review of studies published between 1966 and 1996 on psychosocial factors in CHF, Profant and Dimsdale (2000) [67] suggested that psychosocial factors may be important precipitants for decompensation and hospitalization of patients with CHF. The authors suggested that comorbid depression may also play a role in the exacerbation of CHF, although very few studies were done in this area.

In summary, CHF is a major health problem that is increasing in incidence and prevalence, at a time when rates of other cardiovascular diseases are decreasing. CHF is associated with high mortality and elevated hospital readmissions. Although a number of psychosocial factors have been associated with early readmission, functional impairments and exacerbation of CHF, the literature on these factors in CHF patients, particularly on depression, is sparse. The literature on the psychosocial factors in CHF patients, and in other cardiovascular and chronic disease conditions will be reviewed in the following sections.

2.2 DEPRESSION

2.2.1 DEFINITION

The psychological and psychiatric literature on depression uses the term *depression* in two ways: as a psychiatric disorder, and as a point above a given limit of severity on a continuum of depression symptoms. As a psychiatric disorder, depression is diagnosed according to the criteria listed in the Diagnostic and Statistical Manual (DSM-IV) of the American Psychiatric Association (1994).[68] DSM-IV defines major depression as the presence of five or more of the following symptoms, significant weight loss, sleep disturbances, fatigue, inappropriate guilt, problems concentrating, and suicidal ideation; with at least one of the symptoms being either depressed mood and/or loss of interest or pleasure. These symptoms must be present most of the day nearly every day for at least two weeks, and must not be due to the direct physiological effects of a substance or a general medical condition. They also must have resulted in impairment in day-to-day functioning.

DSM-IV provides research diagnostic criteria for defining minor or subsyndromal depression, as either depressed mood or loss of interest or pleasure in activities, with at least two but fewer than five of the symptoms of a major depressive episode previously cited, being present during the same 2-week period, accompanied by functional status impairment.

Researchers are increasingly using measurement approaches that assess depression as a continuum of symptoms with a varying degree of severity, rather than as a categorical diagnosis. This approach fits in with the physiology of depression, which is likely to represent a spectrum of increasing pathology with increasing severity of depression.

Among the authors who have assessed depression as a continuum, many have used a screening-based definition to define 'minor depression' as those individuals with lower scores than are required for a diagnosis of major depressive disorder. The term mild to moderate symptoms of depression has also been used by others who have defined it as any score greater than a pre-determined cut-off score on a depression screening instrument.[10,69]

2.2.2 PREVALENCE OF DEPRESSION IN THE COMMUNITY

Depression is the most commonly reported psychiatric illness, causing considerable suffering and disturbance in the lives of those affected and those around them. In 1996, the Global Burden of Disease Study ranked depressive disorders as the leading cause of disability worldwide with regard to years lived with disability, and the study projects major depression to be the leading cause of the overall burden of illness by 2020 (taking into account both disability and mortality), following ischemic heart disease.[12]

The prevalence of major depression in community samples is estimated to be particularly high. According to the National Population Health Survey (NPHS),[7] the estimated one-year prevalence for major depressive episodes was 4.5% in Canada over the period from 1994 to 1999, a prevalence figure that has been shown to have remained steady at about 5% over the 40-year period of assessment in the Stirling County study in Canada.[6] One-year prevalence estimates in the United States have varied from 3.7% in the National Institute of Mental Health (NIMH) multisite Epidemiologic Catchment Area (ECA) program to 10.3% in the National Comorbidity Survey (NCS).[31,33,70] The variability among

these studies has been attributed to the use of different diagnostic instruments, the years assessed, and the age and sex of participants.

Large epidemiological studies have reported prevalence estimates for depressive symptoms ranging from 11.8% to 24%,[8,9,71] and most importantly, in these studies depressive symptoms were also found to be a risk factor for future major depression.[72-74]

Depression is greater in women than in men. The NPHS data in Canada are consistent with that of the ECS and NCS in the US, in finding approximately twice as many women reporting major depression than men. This higher risk for women holds true for all age groups,[33,70] and has also been reported for more minor or subsyndromal forms of depression in several other studies.[72,6,11]

Depression is more prevalent among those aged 15 to 34, declines in mid-life, and may be lowest among those aged 65 or older,[7,8,33] although some recent research suggests that the prevalence increases in the very old.[75,76]

2.2.3 PREVALENCE OF DEPRESSION IN CARDIAC DISEASE AND IN CHF

In hospitalized cardiac patient samples, one-month prevalence estimates for major depression range from 16% to 22% [23,77,78] and from 12% to 31% for depressive symptoms (measured as a continuum of increasing severity),[10] somewhat higher than the one-month prevalences for major depression (2.6% to 5.7%),[7,79] and for depressive symptoms (8.4% to 24%),[8,73] found in community samples.

There has been comparatively little research on the prevalence of depression in patients with CHF. This literature was summarized in a review by Thomas et al. (2003)[30]

for 8 studies published up to 2003. We searched MEDLINE and PSYCHINFO and found an additional 7 studies. All these studies are summarized in Tables 1 and 2, which are an update of a table presented in Thomas et al. in 2003. These studies suggest that the prevalence of depression is particularly high in CHF. It ranges from 11% to 48% among out-patients[80,81] and from 13.9% to 77.5% among hospitalized patients.[28,82] It is at least 3 times higher than in the general population and greater than that seen in patients with other chronic medical conditions.[83] In a community-based epidemiological study of people aged 70 and older, Turvey et al. (2002)[80] found a higher prevalence of depression on the short-form CIDI in patients with heart failure (11%; n= 199) than in those with other heart conditions (4.8%; n= 1,856) or with no heart conditions (3.2%; n= 4,070). Patients with heart failure were twice as likely as patients with other or no heart conditions to have depression, even after controlling for number of common chronic illnesses, symptomatic fatigue and apnea, and cognitive and physical impairment.

Among outpatients with CHF, Rumsfeld et al.'s study (2003)[29] is the largest study of depression found in the literature. They prospectively followed a cohort of 460 outpatients with an ejection fraction of less than 40%, and reported that 30.2% of their sample had substantial depressive symptoms at baseline using the Medical Outcomes Study-Depression (MOS-D) questionnaire. Depressed patients were also at increased risk for significant worsening of their heart failure symptoms, physical and social functional status, and quality of life. In addition, depressive symptoms were found to be the strongest predictor of decline in health status at 6 weeks follow-up, after adjusting for baseline health status.

Table 1. Studies of Depression Among Outpatients with Heart Failure *

Authors	Sample	Sex M/F	Mean age (range)	PREVALENCE OF DEPRESSION			
				MAJOR DEPRESSION		SYMPTOMS OF DEPRESSION	
				Scale	%	Scale	%
OUTPATIENTS							
Gottlieb & al. 2004 [81]	155	122/33	64 (33-85)	—	—	BDI (≥10)	48%
Gutierrez & Davis 1999 [85]	40	20/20	24-86	SCID	15%	BDI (≥13)	17.5%
Havranek & al. 1999 [86]	45	31/14	54	—	—	CES-D (≥16)	24.4%
Martensson & al. 2003 [87]	48	48/excluded	61	—	—	BDI	35% (12% mild, 21% mod., 2% sev.)
Murberg & al. 1998 [88]	119	85/34	66	—	—	SDS	40%(27% mild.-mod., 11% mod., 2% sev.)
Rumsfeld & al. 2003 [29]	466	352/114	Not provided	—	—	MOS-D (≥0.06)	30.2%
Skotzko & al. 2000 [84]	33	30/3	64	—	—	CES-D (≥16)	42%
Turvey & al. 2002 [80]	199	75/124	76	CIDI (short form)	11% syndromal	—	—

* Modified from Thomas et al. (2003). [30]

BDI=Beck Depression Inventory; CES-D=Center for Epidemiologic Studies Depression Scale; CIDI=Composite International Diagnostic Interview; DIS=Diagnostic Interview Schedule; MOS-D=Medical Outcomes Study-Depression Questionnaire; SCID=Structured Clinical Interview for DSM-IV; SDS=Zung Self-rating Depression Scale.

Table 2. Studies of Depression Among Hospitalized Patients with Heart Failure *

Authors	Sample	Sex M/F	Mean age (range)	PREVALENCE OF DEPRESSION			
				MAJOR DEPRESSION		SYMPTOMS OF DEPRESSION	
				Scale	%	Scale	%
HOSPITALIZED							
Freedland & al. 1991	60	26/34	78.4	DIS	17%	—	—
Freedland & al. 2003 [89]	682	327/355	66	DIS	36% (20% major D, 16% mimor D)	BDI (≥10)	51%
Friedman & al. 2001 [154]	170	87/83	72.7 (50-93)	—	—	CES-D (≥10)	30%
Fulop & al. 2003 [90]	203	95/108	76.8 (65-98)	SCID	Baseline: 22% 4 weeks:20% 24 weeks: 17%	GDS(≥10)	Baseline: 36% 4 weeks: 33% 24 weeks: 26%
Jiang & al. 2001 [28]	374	236/138	median: 63	DIS	13.9%	BDI (≥10)	35.3%
Koenig & al. 1998 [91]	107	51/56	55.1 (60-89)	DIS	58% (37% major D, 22% minor D)	—	—
Vaccarino & al. 2001 [82]	391	198/193	Not provided	—	—	GDS (6-7 mild, 8 to 10 moderate, ≥11 severe)	77.5% (35% mild, 33.5 moderate, 9% severe)

* Modified from Thomas et al. (2003) [30].

BDI=Beck Depression Inventory; CES-D=Center for Epidemiologic Studies Depression Scale; DIS=Diagnostic Interview Schedule; GDS=Geriatric Depression Scale; SCID=Structured Clinical Interview for DSM-IV.

Gottlieb et al.'s stud (2004)[81] evaluated 155 outpatients with CHF and found nearly one-half (48%) of their sample depressed using a score of 10 or higher on the Beck Depression Inventory (BDI). Depressed patients tended to be younger; women were more likely to be depressed than men, and depressed patients scored significantly worse on quality of life measurements than patients who were not depressed. A high prevalence of symptoms of depression has also been reported in five other small sample studies of outpatients with CHF, with estimates varying from 11% to 42%. [84, 85, 86, 87, 88]

Among hospitalized patients with CHF, Freedland et al. (2003)[89] published the largest study of depression found in the literature in 2003. They administered the Diagnostic Interview Schedule (DIS) to a series of 682 hospitalized patients and found 36% of their sample to have depression, 20% major depression and 16% minor depression, respectively. Among the 613 patients who also completed the BDI, 51% were classified as depressed. However, the authors attributed the high prevalence of depression with the BDI to its low specificity, since 45% of the patients identified by the BDI were not recognized as depressed by the DIS. Jiang et al.'s study[28] used the BDI to screen 374 hospitalized patients with CHF and found that 35.3% of the patients had mild to moderate symptoms of depression, and 13.9% of the patients had major depression using a modified version of the DIS. Furthermore, patients with major depression were more than twice as likely as nondepressed patients to die or be readmitted within 3 months to 1 year after hospitalization.

Vaccarino et al (2001) reported the highest prevalence of depression among inpatients.[82] They evaluated 391 inpatients with CHF and found 77.5% with depressive

symptoms (35% of the patients classified in the mild range, and 33.5% and 9% in the moderate and severe depression range), using the Geriatric Depression Scale (GDS) Short-Form.

Furthermore, the few studies that prospectively evaluated depression in patients with CHF suggest that depression in this patient population may be sustained over an extended period of time. For example, in a 6-month follow-up study of 203 older adults hospitalized for CHF, Fulop et al. (2003)[90] reported that 22% of their sample was depressed at baseline according to the SCID. At 4 weeks after discharge, 53% of the patients who were depressed at discharge remained depressed, and 29% remained depressed after 6 months. Furthermore, patients who had been identified as depressed at discharge had a higher number of medical encounters by 24 weeks post hospitalization (in terms of physician visits, emergency department visits, hospital admissions, laboratory tests, and rehospitalization days), than the nondepressed patients.

Similarly, Koenig (1998)[91] reported that 58% of their sample of 107 hospitalized patients for heart failure were identified as depressed, 36.5% with major depression and 21.5% with minor depression. Over 40% of the depressed patients remained depressed at one year following discharge, and these patients used more outpatient and inpatient medical services than nondepressed patients.

In summary, depression is highly prevalent in CHF patients, with the highest prevalences reported in hospitalized patients compared with outpatients with heart failure. It is higher than the prevalence of major depression and depression symptoms reported in hospitalized patients following an acute MI[23,78,92] a coronary artery bypass graph (CABG)

surgery,[20] or in patients hospitalized with unstable angina [22]. In order to provide a point of comparison for the prevalence of depression in CHF, the following section reviews the prevalence of depression in patients with three commonly reported chronic conditions, namely stroke, RA and cancer.

2.2.4 PREVALENCE OF DEPRESSION IN STROKE, RHEUMATOID ARTHRITIS AND CANCER

The prevalence of post-stroke depression has been reported to vary from 14% to 55%, with major depression occurring in 5% to 31% of patients[93-97] and minor depression in 5% to 44% of patients.[93,98-100] As with the literature on community prevalences, the wide discrepancies may be attributed to methodologic heterogeneity such as the settings from which the populations were sampled, the use of different assessment instruments and selection criteria for depression, and the time of assessment after stroke (See Appendices A-1 and A-2).

In fact, in a recent literature review on the epidemiology of post stroke depression, Whyte and Mulsant (2002)[101] reported that depression varies with the time since the stroke, with a peak period prevalence of depression around 3 to 6 months after the stroke, and a prevalence that remains high even 1 to 3 years after the stroke. Pohjasvaara et al. (1998)[102] studied 277 patients at 3 months after stroke and found depression in 40% of the patients, with 26% as having major depression and 14% minor depression. Studies that have included evaluation of hospitalized patients undergoing rehabilitation in the acute stage after stroke reported the highest prevalence of depression, with estimates that ranged from 29% to 55%.[103,104]

In patients with RA, estimates of the prevalence of depression have been reported in the range of 15 to 66%.[105-109] In a large USA community-based study including 1,152 RA patients, Hawley and Wolfe (1993)[110] reported a prevalence of depression of 25 – 20%. In a study by Frank et al. (1988),[111] 42% of their sample of 137 RA patients met criteria for some form of depression, including 17% for major depression. The majority of the studies in RA have included self-reported measures of the severity of depression, in contrast to using psychiatric examinations to diagnose depression on the basis of the DSM symptom criteria (see Appendix A-3).

Among cancer patients, studies have also yielded variable estimates of the prevalence of depression, ranging from 7.8 to 25.5% for hospitalized patients [112,113] and from 7.1 to 36.6% for outpatients.[114-117] The different times of assessment of depression during the patient's illness, as well as the setting from which subjects were recruited (whether patients were recruited from outpatient clinics or inpatient hospital settings) have been reported as factors contributing to the wide variations in the prevalence of depression (see Appendix A-4 and A-5).

In samples of women with breast cancer, reported prevalence of depression vary roughly from 4.5% for major depression up to 27% for minor depression. [116,118] In a cross-sectional study of 303 women with early-stage breast cancer, Kissane et al. (1998)[116] found major depression in 9.6% and minor depression in 27% at 3 months after breast surgery. Among hospitalized cancer patients, Ravazi et al. (1990) [113] found 7.8 to 25.5% of their sample of 210 inpatients to have major depression.

Methodological limitations, common to all studies of depression examined for this review, impede comparison of the various estimates of the prevalence of depression, and restrict the conclusions that can be drawn from the present review. Differences in recruitment strategies and in the setting from which subjects were sampled, differences in times of assessment of depression in the course of patient's illness and varying illness severity, are among the most common sources of methodologic heterogeneity observed in these studies, that contribute to the wide variations in the prevalence of depression reported.

Despite these methological limitations, the following observations can be made. Across the studies reviewed, the prevalence of depression is higher among patients in hospital and rehabilitation settings, than in patients recruited from outpatient clinics and in the community. The prevalence of depression also varies with the time since diagnosis of the illness, its severity and course. These differences in prevalence of depression are congruent with research on the epidemiology of depression, which suggest that symptoms of depression fluctuate markedly in severity over time, and that there is considerable variability in the length of depressive episodes and recurrence. What is clear from these studies is that the prevalence of depression in patients with commonly reported chronic illnesses, such as stroke, RA and cancer, is at least as important as that seen in cardiac patients samples. However, the highest prevalence estimates are reported in CHF patients.

There is comparatively less data on depression in CHF patients, particularly on the prognostic implications of depression in this group. The section that follows reviews the

literature on the correlates of depression and its associated morbidity and mortality in other cardiovascular diseases.

2.2.5 PROGNOSIS OF DEPRESSION IN CVD

Depression is common among patients with cardiovascular disease (CVD), and a growing body of literature indicates that depression is associated with increased health care utilization, increased health care costs and negative health outcomes (e.g. recurrent coronary events, and cardiovascular mortality). In fact, recent literature suggests that depression also has an adverse impact on the development of cardiovascular disease in initially healthy individuals.[119]

Depression is associated with increased health care utilization and increased health care costs among community residents[9,17] and medical populations.[18] Among patients with CVD, Frasure-Smith et al. (2000) examined the relationship between post-MI depression and health care costs both during the index admission and during the following year.[19] The authors found that during the MI admission those with mild to moderate symptoms of depression had estimated costs that were about 11% greater than other cardiovascular patients. Costs during the first postdischarge year were about 41% higher for depressed than for nondepressed patients. This difference was not associated with major cardiac treatment procedures. During the index admission and over the first post-MI year, depressed patients spent more time in-hospital than did the nondepressed. Depressed patients also visited emergency rooms more often and saw physicians on an outpatient basis on average two to three times more than nondepressed patents.

In patients with coronary artery disease, depression is an independent risk factor for the occurrence of major cardiac events, raising the risk of cardiac events by a factor of two to four, independent of demographic and disease severity variables. For example, the presence of major depression at the time of coronary angiography more than doubles the risk that a major cardiac event will occur within one year.[77] Major depression diagnosed at discharge is also associated with a more than 2-fold increase in risk of death or readmission in the 12 months following CABG surgery.[20] In addition, it has been shown that the relationship between depression and cardiac morbidity and mortality may persist up to 3 years after CABG surgery.[21] There is a similar depression-related increase in risk for 1-year cardiac events in patients admitted for unstable angina.[22]

In patients who suffered an acute MI, post-MI depression is a significant predictor of cardiac morbidity and mortality. [10,23,24] Major depression was associated with a more than 4-fold increased risk of mortality during the first 6 months following acute MI[23] while depressive symptoms were associated with at least as great an increase in cardiac mortality during 18 months of follow-up following MI, even after controlling for cardiac risk factors (age, measures of disease severity or Killip class, and previous MI).[10]

Furthermore, it has been shown that the impact of depression may be sustained over an extended period of time. Welin et al. (2000)[120] assessed 275 patients for depression within 3 months after MI and found that depression was associated with an increased risk of subsequent cardiac death as well as total mortality over 10 years of follow-up. Lastly, of all the psychosocial risks studied in cardiovascular disorders, several literature reviews

have concluded that depression is the most prevalent and best supported by epidemiological evidence.[121-124]

The adverse impact of depression on the development of cardiovascular disease has recently been documented from community-based studies.[119] In a meta-analysis conducted in 2002, Rugulies[25] reviewed cohort studies with clinical depression or depressive mood as the exposure, and MI or coronary death as the outcome. The author showed that depression predicts the development of coronary heart disease in initially healthy subjects, with relative risks ranging from 1.50 to 4.16. He found a stronger effect size for clinical depression compared to depressive mood, thus suggesting a dose-response relationship between depression and coronary heart disease. The INTERHEART Study,[26] a case-control study with 11,119 patients with a first MI and 13,648 age-matched and sex-matched controls, was carried out to evaluate the associations of several psychosocial stressors with the risk of acute MI across different populations worldwide with various ethnic origins. This large case-control study showed that depression was associated with more than one and one half the risk of acute MI in both men and women from 53 countries, and across different ethnic groups.

Depression is common in patients with CHF and several studies have associated depression with declines in activities of daily living, higher rates of hospitalization, and even increased mortality. Clarke et al. (2000)[27] and Jiang et al. (2001)[28] provided epidemiologic evidence of the prognostic implications of depression in patients with CHF. In a subsample of 2,992 patients with CHF included in the SOLVD database, high levels of depressed mood and social isolation were found to be significant predictors of risk for

experiencing severe limitations in intermediate and social activities of daily living at 1 year.[27]

Recently, Rumsfeld et al. (2003)[29] demonstrated the impact of depressive symptoms on heart failure specific health status over time. In their longitudinal cohort study of 460 patients with CHF, they found that the depressed patients, as assessed by the Medical Outcomes Study-Depression Questionnaire (MOS-D), were at greater risk for significant worsening of their heart failure symptoms, physical and social function, and quality of life over the 6 week follow-up period, compared with the non-depressed. The differences remained after adjustment for demographic, cardiac, comorbidity, baseline health status, and heart failure treatment variables. Moreover, depressive symptoms were the strongest predictor of decline in health status in the multivariate models.

Depression has also been found to be a strong predictor of repeated admissions, independent of initial severity of heart failure illness. For example, in Jiang et al.'s study (2001)[28] patients with major depression had the highest readmission rates at 3 months and 1 year (52.2% and 80.4%, respectively), followed by the mild depression group (42.6% and 55.6%) and the no depression group (36.5% and 52.3%). In addition, patients with major depression had more than twice the risk of being readmitted at 1 year after hospitalization compared to patients with no depression, after controlling for age, NYHA class and baseline ejection fraction.

There is now evidence that depression is associated with increased mortality in patients with CHF. In a recent review of the literature on the incidence, the physiologic effects, and the relation of depression to mortality in patients with heart failure, Thomas et

al. (2003)[30] examined five recent studies that have looked at the impact of depression on mortality in patients with heart failure (four studies that recruited patients while hospitalized and one community-based sample). According to Thomas et al. (2003)[30] none of the studies reported significant differences in mortality between the patients who were depressed and those who were not depressed. However, when the authors combined the cases from the four studies that specified the number of patients who died, depressed patients were at significantly greater risk for death than the nondepressed. From the pooled data, mortality rates for the shortest follow-up period reported in each study was 18.7% for the depressed patients in contrast to 9.7% for the nondepressed. For the longest follow-up periods (12 months or more), the pooled mortality rates for the depressed were 21.1% in contrast to 15.8% in the nondepressed. Moreover, studies that examined the correlation between depression and mortality, contrasting the different degrees of depression, found a significant trend to increased mortality with increasing levels of depression.[82,88]

Similarly, Jiang et al. (2001)[28] reported that patients with major depression had the highest mortality rates at 3 months and 1 year (13.0% and 26.1%), compared to patients with mild depression (7.4% and 11.1%) and patients who had a BDI score of 10 or higher (5.7% and 13.7% respectively). However, when risk factors such as age, NYHA class, and ejection fraction were accounted for, 3-month and 1-year mortality rates comparing patients with major depression and those without depression, were not statistically significant. In terms of readmissions at 1 year, the effect of major depression remained statistically significant. In contrast, Murberg et al. (1999)[125] prospectively followed 119 CHF outpatients for a period of 2 years and found statistically more deaths ($p<.05$) among

the depressed patients (a score of 50 or higher on the Zung Self-Rating Depression Scale) compared to the nondepressed patients (25% versus 11.3%). Depressed patients were almost four times more likely to die within 2 years compared to the nondepressed patients.

While there seems to be a consensus from available studies that depression is associated with increased morbidity and mortality in patients with CHF, the influence of depression on the development of CHF has only recently been addressed. Williams et al. (2002)[126] examined the effect of depression on the incidence of heart failure in a community sample of 2,501 persons aged 65 years or older, who were free of heart failure at baseline. In this sample, 188 scored as depressed using the CES-D (cutoff point of 21 or higher). During their 14-year follow-up, 313 participants developed heart failure, defined as hospitalization for heart failure or death due to heart failure. Depression was associated with a 52% increase in the risk of heart failure. However, after controlling for heart failure risk factors such as hypertension, diabetes, and history of MI, this association was no longer significant in men, but remained significant in women.

2.2.6 ETIOLOGY OF DEPRESSION

Research on the etiology of depression suggests that depression is a multifactorial disorder, resulting from interactions involving a complex set of influences.[127] A variety of demographic and psychosocial variables have been shown to influence depression. Depression appears to be more common in women, being between the ages of 20 and 40, being separated or divorced, having lower occupational income, or educational levels, and being unemployed and distressed about this situation.[31,32]

There is also evidence for an etiologic role for physical disability,[128] comorbidity,[33] and for poor social support[34,35] in both the development and recurrence of depression. The role of patients' subjective views of their illness, or illness perceptions, has received increasing interest in recent years. Research suggests that among patients with chronic illnesses, beliefs about illness are important factors influencing medical, social, and psychological outcomes including depression.[39,41,42]

In summary, studies on depression in cardiovascular patients have shown that depression is associated with negative health outcomes, recurrent cardiac events and cardiovascular mortality. In this context, the impact of concurrent depression in CHF patients, a group that already has impaired cardiac function and reduced survival, can be most devastating. A number of psychosocial factors have been associated with depression and negative health outcomes in several studies involving cardiac patients samples, however, as reviewed earlier, the literature on these psychosocial factors and how they relate to health outcomes in CHF patients is sparse. Emerging studies on psychosocial determinants of functional status have proposed that patients' subjective views of their illness may be important factors contributing to both psychosocial and physical outcomes in patients with various chronic illnesses. Therefore, the importance of illness perceptions as they relate to outcomes for cardiovascular patients will be reviewed.

2.3 ILLNESS PERCEPTIONS

Patients' subjective views of their illness, or 'illness perceptions,' involve beliefs about the etiology of the illness, beliefs about the course of their illness, how long it will

last, the extent to which the illness is amenable to control or cure, and the seriousness of the consequences of the illness on their lives and the lives of those around them. Some researchers have found that these beliefs or perceptions are important factors influencing medical, social, and psychological outcomes in a variety of diseases.

The concept of illness perceptions has its roots in contemporary cognitive psychology and in social cognition theories. According to the cognitive approach, individuals construct models, or internal representations of the external world, to help them understand their experience. These internal representations will then serve as a guide for their own behaviors.[129] Leventhal developed the self-regulatory model in the context of illness or in response to health threats.[36,37] He proposed that patients group their ideas about illness around six coherent themes or dimensions, which health psychologists have called illness perceptions. These dimensions provide a framework for patients to make sense of their symptoms, assess health risk, and direct action during recovery. The six cognitive dimensions are: (1) *Identity*, beliefs about the number of symptoms that the patient identifies as linked to heart failure; (2) *Cause*, beliefs about what causes the illness or its etiology; (3) *Timeline*, beliefs about the duration of the illness (whether it will be acute, episodic, or chronic); (4) *Consequences*, beliefs about the severity of the illness and how it affects various aspects of patients' life and functioning (physical, social and psychological); (5) *Cure* or *Control*, beliefs about the likelihood that the illness can be cured or controlled (treatment control and personal control); and (6) *Coherence*, the coherent understanding of the illness. This latter dimension reflects the way in which the patients evaluate the consistency or usefulness of their illness representation.[130] These six

cognitive dimensions or representations are theorized to arise soon after the onset of initial symptoms. It is also proposed that these representations will change with disease progression, with new symptoms and treatment responses.

Illness perceptions have been found to vary widely across a number of chronic illnesses, and even among individuals with the same illness severity[131,132] More importantly, illness perceptions have been shown to predict both physical and psychological outcomes, including depression.

A number of cross-sectional studies provide empirical support for the importance of illness perceptions in directing health-protective behavior, recovery and adjustment. In a cross-sectional study of illness perceptions in three groups of patients with different chronic illnesses (chronic obstructive pulmonary disease, rheumatoid arthritis, and psoriasis), Scharloo et al. (1998)[38] found that patients' beliefs about their illness duration, illness identity, and the extent to which the illness is amenable to cure or control contributed a significant improvement in the explained variance in outcome measures of physical, role, and social functioning, after statistically controlling for the effects of illness duration and disease severity variables. Murphy et al. (1999)[39] explored the relationship between depression and illness perceptions in 62 outpatients with rheumatoid arthritis. They found that compared to the nondepressed, depressed patients felt that their illness had more severe consequences, that they had less control over their illness, and that their illness would not be cured, even after controlling for the effect of perceived functional disability. Jopson and Moss-Morris (2002)[40] measured illness perceptions in 168 multiple sclerosis patients and found that a strong sense of personal control and beliefs in the serious

consequences of the illness contributed significantly to the variance in depression, even when the effects of disease severity were taken into account.

Some longitudinal studies provide further evidence for the role of illness perceptions in predicting both physical and psychological outcomes. In patients with chronic obstructive pulmonary disease,[41] and in patients with rheumatoid arthritis,[42] Scharloo et al. (1999, 2000) have shown that illness perceptions significantly predict the number of visits to the outpatient clinic, the number of hospital admissions, social functioning, and measures of mental health, including depression, one year later, after statistically controlling for the effects of medical variables. In another study among patients with psoriasis,[43] beliefs in adverse consequences of the disease and less perceived control over the course of illness were associated with more visits to the outpatient clinic, and more hospital admissions at one year.

In cardiac patients, Petrie et al. (1996)[44] found that patients' beliefs about their heart attack soon after admission to hospital significantly predicted later attendance at a rehabilitation program, speed of return to work, later sexual difficulty, and recovery of social and domestic functioning, measured 3 and 6 months later. Patients who strongly believed that their illness was amenable to cure or control were more likely to attend rehabilitation programs whereas those who anticipated that their illness would have major consequences on their life were slower to return to work and resume social and domestic duties. Similarly, Cooper et al. (1999)[45] found that patients with a stronger belief that their heart condition is controllable showed a higher rate of attendance at cardiac rehabilitation. In these studies, illness perceptions were not linked to objective indicators of MI severity

nor did the indicators significantly predict the outcomes that were predicted by illness perceptions. Gump et al. (2001)[46] studied illness perceptions in 309 coronary artery bypass graft surgery patients and found that those who believed that they had no control over the disease made significantly fewer postoperative health behavior changes at 6 months following surgery. Lastly, Moser et al. (1995)[133] evaluated the perceptions of control in 176 patients after their cardiac event (MI or CABG), and found that patients with high versus low perceptions of control at baseline had better functional status at 6 months after their cardiac event, less anxiety and depression after controlling for sociodemographic and clinical variables.

Preliminary evidence suggests that interventions designed to alter the patient's illness perceptions can be successful in post-MI patients. Petrie et al. (2002)[134] reported that a brief in-hospital intervention was successful in changing patients' negative illness perceptions and improving functional outcome after MI. They randomized 65 first-time MI patients to receive either standard care, which involved in-hospital visits from a cardiac rehabilitation nurse who provided standard MI educational material, or three 30- to 40-minute intervention sessions conducted by a psychologist, which were personalized to fit patients' responses on the Illness Perceptions Questionnaire. In these sessions, the patients' beliefs about the cause of the MI and potential risk factors were explored, and a plan was developed to alter risk factors and increase beliefs about control of the illness. The results showed that patients in the intervention group had lower levels of belief that their heart condition would have serious consequences for their life and last a long time, compared with the control group; they also had higher levels of beliefs that their heart condition could

be controlled, and lower levels of distress about symptoms. In addition, after controlling for MI severity variables, the patients in the intervention group reported significantly fewer angina symptoms at 3 months compared to patients in the control group, and returned to work at a higher rate, a difference that was maintained over the 3-month follow-up period.

Weinman and Petrie (1997)[129] suggest that the illness perception approach has considerable potential for research, offering opportunities to explore and identify important aspects that would facilitate patients' adjustment to illness, and also opportunities to assess interventions that would integrate patients' cognitions or perceptions.

CHF patients' views or perceptions about their illness may play a pivotal role in the course and outcome of their illness. The importance of controlling dietary and fluid intake, and the need for constant monitoring of complex medical regimens and symptoms, are part of the daily reality of living with heart failure. Leventhal's self-regulatory model[36] predicts that patients who believe that they have no control over their disease, or that available treatment is useless in controlling their symptoms, will engage in fewer health behavior changes, and show lower adherence to treatment recommendations. In the context of CHF, patients who believe that they cannot control dietary and fluid intake, or that such control is useless, may be less likely to adhere to treatment, and, therefore, experience worse physical functioning. In addition, the physical incapacity associated with heart failure, the loss of social roles associated with the incapacity, the uncertainty about the course of the illness, and the frequently changing and complex medical regimen, may cause CHF patients to believe that their illness has serious, perhaps uncontrollable consequences on their lives and those around them, which in turn may result in higher depressive symptoms.

To our knowledge, illness perceptions examined from the point of view of Leventhal's self-regulatory model[36] have not been studied in patients with heart failure. However, the relationships of perceived control with psychological and physical outcomes in CHF have received some attention. In a cross-sectional study of 222 patients with CHF, Dracup (2003)[135] found that higher perceived control, as measured with the Control Attitudes Scale, was significantly associated with greater 6-minute walk distances, less anxiety, less depression and hostility. The results of this study indicate that illness perceptions may be particularly relevant to the experience of CHF patients. Further exploration of the concept of illness perceptions as it relates to depression and functioning in CHF patients is certainly needed.

2.4 FUNCTIONAL STATUS

The term *functional status* has been used, defined and assessed in several different ways. It has often been used to refer to the concepts of health status, physical disability, well-being, quality of life; and also used synonymously with the terms functional disability and functional performance. Leidy (1994)[136] has proposed an analytical framework for the study of functional status, based on an evaluation of available definitions and conceptual models. She defines 'functional performance' as "a multidimensional concept, characterizing one's ability to provide for the necessities of life, that is, those activities people do in the normal course of their lives to meet basic needs, fulfill usual roles, and maintain their health and well-being" (Leidy, 1994, p.197).

Studies of the determinants of functional status involving older adults and patients with chronic illnesses have primarily explored the predictive value of physical indicators of chronic illness such as objective measures of disease severity, symptoms, or comorbidity measures, to explain functioning. However, these studies have been unable to explain much of the variation in patients' adjustment and functioning.[137,138] Not only are disease severity variables and comorbidity measures inconsistently associated with functioning, the clinical utility of these as predictors is limited by the fact that they are not amenable to change.[45]

The role of depression in explaining functioning has been the center of much research. Many longitudinal community studies have found evidence for a detrimental effect of depression on physical functioning over time. Depressive symptoms have been associated with limitations in functioning equal to or greater than that found with major chronic medical conditions.[139] For example, Penninx et al. (1999)[140] examined the effect of depression on the incidence of physical disability over a 6-year period, in a cohort of 6247 subjects who were initially free of disability. They found that the depressed subjects had an increased risk of 39% and 45% for developing disability in activities of daily living and mobility, respectively, even after controlling for sociodemographic characteristics and baseline chronic conditions. Similarly, longitudinal studies in primary care outpatients,[141] medical inpatients,[142,143] and rehabilitation settings,[144, 145] have found depression to be a risk factor for increased incidence of disability, even after controlling for disease severity. In fact, in these studies, disability was more strongly associated with depression than with disease severity variables.

In cardiovascular patients, the role of depression in functioning has also been investigated. Steffens et al. (1999)[146] found that the presence of major depression in CAD patients was significantly associated with functional disability, when controlling for age, gender, and medical illness severity. In a longitudinal study of 198 patients who had elective cardiac catheterization, Sullivan et al. (1997)[147] reported that change in physical function from baseline to one year was associated with baseline depression, but not with the baseline number of occluded coronary arteries, even after controlling for demographic characteristics, medical covariates, and comorbidity. Recently, in another study, Sullivan et al. (2000)[148] showed that the relationship between depression and functional status in patients with CAD persists over a period of five years, with the persistent link likely due to the chronic and recurrent nature of depressive symptoms and the persistent nature of disability. In a study of 4560 patients with CAD, Spertus et al.(2000)[149] reported that higher depression was significantly related to increased frequency of angina and physical limitation, with lower satisfaction with treatment for CAD and perceived quality of life. In addition, the authors reported that patients who remained depressed or who became depressed over the 3 months follow-up, had significant deterioration in functional status.

CHF imposes a great impact on patients' functioning. In fact, the decrements in functioning associated with heart failure have been shown to equal and even surpass those of many other chronic physical illnesses. In a study of functioning and well-being among 9385 patients with various chronic illnesses, Stewart et al. (1989)[150] found that patients with heart failure had the worst role functioning, the poorest physical and social functioning, and also had the poorest overall rating of current health in general, compared

with patients with all other illnesses studied. Heart failure-related symptoms contribute to the restriction of patients' daily physical activities. The most common symptoms of heart failure reported by patients across many studies are fatigue and dyspnea resulting from exertion.[151] Edema, palpitations, cough, sleeplessness, and angina are additional common symptoms of heart failure.[152] Recently, in a study comparing people aged 45 years or older randomly sampled from the population, with patients selected from different diagnostic groups of chronic medical disorders, including heart failure, Hobbs et al. (2002)[153] reported that patients with heart failure had statistically significant worse physical and mental health, compared with the general population. They also reported worse physical impairment of quality of life compared to patients with chronic lung disease or arthritis.

While depression has been consistently associated with functional disability and lower quality of life in cardiovascular patients and in other chronic conditions, the role of depression in functioning has a particular importance in the context of heart failure, where patients already experience substantial impairment in health-related quality of life and functioning. Yet, very few studies have explored the relative contribution of depression to physical functioning in CHF patients. Friedman and Griffin (2001)[154] examined the relative contribution of physical symptoms and physical functioning to depression at 4-to-6 weeks after hospitalization, among 170 patients with heart failure. They found that those who had increased physical symptoms and poorer physical functioning reported increased symptoms of depression. They also reported that physical symptoms explained a greater portion (13%) of the variance in depression, compared to physical functioning (2%). Murberg et al. (1998)[88] examined the relationships between physician ratings of functional status (NYHA

class) and patient assessments of functional status with symptoms of depression in a sample of 119 CHF patients from an outpatient practice. The authors found that depression was not significantly associated with NYHA class, but rather, was strongly associated with patients' perceived physical limitations. The authors suggested that depression among heart failure patients may not primarily be related to perceptions of symptoms, as measured by the physician's rating of functional status (NYHA class), but rather to patient's perceived physical limitations. These findings indicate that functional status at least so far as it is assessed by the physician, may not be a prominent factor in determining the occurrence of depressive symptoms in this patient population. In contrast, the role of patient's subjective assessment of limitations in ability to perform daily activities or leisure activities should be incorporated in studies of the relationships between depression and functional status.

Recently, in a small sample study, Carels (2004)[155] examined the cross-sectional associations between disease severity, functional impairment, depressive symptoms, and quality of life among 58 patients with CHF. The study showed that depressive symptoms were associated with diminished physical and emotional quality of life (lower social support and greater social conflict), while left ventricular ejection fraction and functional impairment had a much weaker association with quality of life. The author suggested that depressive symptoms may have a greater impact on quality of life in CHF patients than do severity of cardiac dysfunction or functional impairment. However, this study was limited by the small sample size, and by including relatively mild cardiac dysfunction patients (with LVEF of less than 50%). Nonetheless, this study is among the very few to date that examined the relationships between physical functioning and depression in CHF patients.

In summary, studies of the determinants of functional status involving patients with chronic illnesses have indicated that demographic and disease severity measures are inconsistently associated with functioning. The role of depression in functioning has been increasingly studied, and many studies have provided evidence for a detrimental effect of depression on physical health outcomes in cardiovascular patients. Yet, very few studies have specifically explored the contribution of depression to physical health in patients with CHF. Some researchers have suggested that social support and depression are associated with functional status, but very few studies have explored their interrelationships and their joint impact on physical health outcomes.

2.5 SOCIAL SUPPORT

Social support has been defined and measured in several ways. Cobb (1976)[35] defined social support "as information leading the subject to believe that he is cared for and loved, esteemed, and a member of a network of mutual obligations" (p.300). Social support has been extensively investigated, and generally, similar definitions have been used. In a recent literature review on social support, Mookadam and Arthur (2004)[156] describe three broad categories that have been used to describe social support: "social networks" as the size, density, intensity and frequency of a person's everyday contacts; "social relationships" as the quantity and type of relationships, and "social support" as the emotional, functional, and informational resources provided by others and the quality of those resources. Since the quality and perception of support received by an individual is different than the actual number or types of relationships in an individual's network,

several researchers have used a definition of support that includes both descriptions of network and perceptions or quality of the support.

While several studies have used and measured social support as a unidimensional construct, focusing almost exclusively on the positive aspects of support, more recently, some research has indicated that social support encompasses negative aspects as well (characterized by conflict, criticism, and interference), which are independent of the positive aspects of support and strongly related to low levels of well-being.[157,158] Recent longitudinal studies that have integrated both positive and negative aspects of support have shown that the negative aspects correlate more strongly than positive aspects with measures of psychological symptoms. [159,160,161] Some authors have suggested that the experience of conflict is an important, interpersonal variable, that assumes a major role in depression, [162,163] and that both the positive and negative aspects of relationships must be considered, in the examination of the interpersonal process of support that affects health.

Schroevers et al. (2003)[164] examined the role of positive and negative aspects of social support in depression among 475 cancer patients and 255 individuals without cancer from the general population. They reported that more negative interactions and lower levels of social support were strongly associated with higher levels of depressive symptoms, as measured with the CES-D. More importantly, negative interactions significantly predicted levels of depressive symptoms at 1 year after diagnosis, after adjusting for sociodemographic variables and initial level of depressive symptoms; though this relationship was not observed for positive aspects of social support. Lévesque et al. (1998)[165] reported that increased conflicts in the exchange of informal support was

predictive of an increase in psychological distress over one year. In another study, upsetting informal support was predictive of an increase in depression, though this relationship was not observed for helpful support.[158]

The role of social support in predicting both physical and psychological outcomes has been investigated extensively. A number of authors contend that social support is not an independent causal agent, but, rather, a "protective factor" with its absence constituting a "vulnerability factor" modifying the effect of life stress on depression.[166,167] Several studies have presented theoretical accounts and empirical evidence favoring the vulnerability or buffering model of support. These studies suggest that the presence of social support is directly related to positive evaluation of self, which, in turn, moderates or buffers the ill effect of stressful life events on depression.[35,167,168] Shen et al. (2004)[169] examined the contributions of personality characteristics and social support to physical functioning among 142 patients referred to cardiac rehabilitation. The authors found that social support predicted physical health indirectly through optimism and hostility. More optimistic patients perceived better social support, which in turn led to better physical functioning at follow-up. More hostile patients were more likely to judge their social environment as less supportive, and less favorable physical functioning.

Although several studies provide empirical evidence favoring the vulnerability model of support to explain the impact of social support on disease outcome and depression, other studies favor the main effect model of support, and suggest that the presence of social support is directly related to health and illness.[159,164] Lack of social support has been consistently identified across several study reviews as an independent risk

factor for coronary heart disease events and mortality.[156,170, 171] Yet, in the few studies that have also assessed depression, the effect of social support was in some cases also independent of depression. Although both social support and depression have now each been independently associated with coronary heart disease outcomes, surprisingly there has not been enough research exploring how these psychosocial variables interact to affect cardiovascular outcomes, and as a consequence, the possible mechanisms by which they are interrelated remain poorly understood.[172-175] It remains unclear whether social support is an independent causal agent for depression or a protective factor in the context of life stress. Available studies have shown inconsistent results on the direction of these relationships and on how they relate to cardiovascular morbidity and mortality.[172,175]

Studies of social support in cardiac patients have reported that lack of social support is related to depressive symptoms,[176] to recurrences and worsening of depression symptoms, and increased risk of cardiac events including mortality.[156,177-179] Brummett et al. (1998)[180] assessed the prospective relationship between perceptions of social support and subsequent depressive symptoms in 506 patients one month after cardiac catheterization. They found that patients who reported relatively high levels of social support while in hospital showed more improvement in depressive symptoms during the subsequent month, even after controlling for baseline symptoms of depression, disease severity and demographic covariates. More recently, Brummett et al. (2000)[181] evaluated the associations between social support and depression in a sample of 115 elderly subjects, and found that higher levels of received support at baseline significantly predict decreases in depressive symptoms at both 6 months and 1 year, after controlling for demographic and

baseline depressive symptoms. Holahan et al. (1997)[161] reported improvements in depressive symptoms over periods up to 4 years among cardiac patients with high levels of social support. Oxman and Hull (1997)[182] evaluated CABG surgery patients and reported that perceived adequacy of support 1 month after surgery was related to depression measured at 6 months.

In cardiac patient samples, social support has also been shown to moderate the impact of depression on mortality. Frasure-Smith et al. (2000)[183] examined the interrelationships between baseline depression and social support in terms of changes in depression symptoms and cardiac prognosis in 887 MI patients over one year. They found that social support at the time of hospitalization predicted improvements in depression over a 1-year interval. In addition, the impact of depression on mortality was significantly marked at very low levels of perceived social support, but for higher levels of perceived social support, there was no depression-related increase in cardiac mortality. The interaction of depression and social support with 1-year cardiac mortality remained significant after adjustment for sociodemographic and disease severity variables. Recently, Barefoot et al. (2003)[159] examined various aspects of social support including social support received and social conflict in relation to depressive symptoms in a sample of 196 patients with MI, both in the hospital and 2 weeks later. They found that high levels of perceived support and low social conflict at baseline were associated with less follow-up depression.

Social support represents an important aspect of living with CHF. The various functions performed by the social support system include that of providing information,

assistance in activities of daily living, and discussing emotional feelings and choices. The patient's ability to seek out and mobilize a social network for assistance may vary, and patients in more advanced stages of heart failure may have more difficulty initiating contact with others than patients with less advanced heart failure.

In summary, an important number of studies have consistently identified social support as a major psychosocial risk factor for depressive symptoms, increased cardiac events and mortality, and other physical health outcomes in cardiac patients. However, very few studies have specifically explored importance of social support on outcomes for CHF patients. Some studies suggest that lack of social support and social isolation may contribute to perceptions of impaired health, rehospitalizations, and mortality.[64,184] According to a study by Vinson et al. (1990),[62] 53% of hospital readmissions for CHF would be preventable, and a failed social system was identified as an important factor contributing to such preventable readmissions. In a study of 292 elderly patients hospitalized with heart failure, Krumholz et al. (1998) [185] found that lack of emotional support was a strong predictor of cardiac events. Murberg and Bru (2001)[186] reported that social isolation was a significant predictor of mortality, controlling for depressive symptoms, heart failure severity, and functional status and age. A better understanding of the role of social support as a potentially modifiable factor influencing depression and functioning is needed to develop intervention approaches with CHF patients.

2.6 CONCEPTUAL FRAMEWORK

The theoretical basis for this study is Leventhal's self-regulatory model,[36] which emphasizes the importance of patients' illness experience. This model is explored within the context of depression and functional status. Depression is conceptualized as a multifactorial experience, resulting from the interaction of a complex set of influences including risk factors, and vulnerability / protective factors or moderating factors.[127] Risk factors are psychosocial measures, such as illness perceptions, which precede and increase the likelihood of subsequent depression. Moderating factors are psychosocial influences, such as social support, that modify the effect of risk factors on depression. That is, a moderating factor can be either beneficial or detrimental by decreasing or increasing the likelihood that a given risk factor will be followed by depression.

Leventhal's self-regulatory model,[36] is also considered within the context of recent work on functional status. Leidy's analytical framework for the study of functional status specifically defines functional performance as "the physical, psychological, social, occupational, and spiritual activities that people actually do in the normal course of their lives to meet basic needs, fulfill usual roles, and maintain their health and well-being" (Leidy, 1994, p. 198). These activities are chosen by the individual, based on personal preference and subject to the limits imposed by capacity.

Understanding the importance of patients' subjective views of their illness, or illness perceptions, in relation to depression in CHF patients may help clarify previous work concerning the relationships between depression and functioning. There is some evidence indicating that depression results in disability, and other evidence indicating that

disability results in depression. It is likely that most measures of functioning are affected by illness perceptions and this may play a part in explaining these relationships.

In the present study, the relationships between illness perceptions assessed at one point (baseline) and depression and functional performance at follow-up were examined. However, because depression is known to increase the likelihood of functional impairment, any link between illness perceptions and functional impairment might occur because illness perceptions are associated with depression at baseline. For that reason, the influence of baseline depression in the relationship between illness perceptions and functional performance among CHF patients is evaluated. If results of this study support the importance of illness perceptions in predicting functional performance for CHF patients, even after adjustment for depression, this would suggest that interventions that modify or take into account patients' illness perceptions may have the potential to improve functioning above and beyond depression treatment. In a similar way, the influence of baseline functional performance in the relationship between illness perceptions and depression at follow-up was also examined.

2.7 OBJECTIVES OF THE STUDY

The ojectives of this longitudinal study were to examine the relationships between baseline illness perceptions, and subsequent depression and functional performance in patients with congestive heart failure. More specifically, the objective was to assess the relationships between six dimensions of illness perceptions (*Identity*, *Timeline*, *Consequences*, *Personal Control*, *Treatment Control* and *Coherence*) and the later

measures of depression and functional performance. The potential moderating effects of social support on the relationships between illness perceptions and depression and functional performance at follow-up were examined. Although the study was originally planned to include the second measurement point at approximately 2 months following baseline assessment, technical problems in reaching patients within this timeframe led to a change to 4 months as the follow-up point.

The ultimate aim of this study was to provide a better understanding of patients' beliefs of their illness as potentially modifiable factors influencing depression and functional performance, and to provide theoretical grounds for designing nursing interventions to modify or take into account patients' illness perceptions with the goal of improving mood and functioning in CHF patients.

2.8 HYPOTHESES

Study hypotheses are presented in Tables 3, 4, 5 and 6. Two groups of primary hypotheses involving the main effect of illness perceptions on depression and functional performance measured at follow-up were evaluated. These primary hypotheses included sub-hypotheses for each of the six dimensions of illness perceptions. For example, it was hypothesized that higher perceptions of serious *Consequences* of heart failure would be related to higher levels of depressive symptoms at follow-up, after controlling for the effect of demographic and clinical covariates and baseline depression (see Table 3).

Next, two groups of secondary hypotheses concerning the potentially moderating effect of social support on depression and functional performance measured at follow-up

were evaluated (see Table 4). These secondary hypotheses included sub-hypotheses involving the two domains of social support: *Support*, defined as the perceived availability of helping behaviors by members of the social network, and *Conflict*, the perceived discord or stress in relationships. We hypothesized that social support moderates the effect of illness perception variables on both depression and functional performance. For example, the magnitude of the relationship between illness perception variables and depression at follow-up would vary as a function of social support.

Lastly, the influence of baseline depression on the relationships between illness perceptions and functional performance at follow-up was examined. Similarly, the influence of baseline functional performance on the relationships between illness perceptions and depression at follow-up was also examined (see Table 6).

Table 3 Hypotheses I and II: Main Effects of Illness Perceptions on Depression and Functional Performance

I. Main Effect of Illness Perceptions on Depression at Follow-Up

In patients with CHF, baseline illness perceptions will be associated with levels of depressive symptoms at follow-up, even after controlling for demographic and clinical covariates, and baseline depression.

Specifically,
a) higher *Identity* perceptions in relation to heart failure symptoms
b) stronger beliefs about a long and chronic illness duration (*Timeline*)
c) higher perceptions of serious *Consequences* of heart failure
d) weaker beliefs about *Personal Control*
e) weaker beliefs about the effectiveness of *Treatment Control*
f) lower perceptions of *Coherence* or understanding of heart failure

} will be related to higher levels of depressive symptoms at follow-up.

II. Main Effect of Illness Perceptions on Functional Performance at Follow-Up

In patients with CHF, baseline illness perceptions will be associated with levels of functional performance at follow-up, even after controlling for demographic and clinical covariates, and baseline functional performance.

Specifically,
a) higher *Identity* perceptions in relation to heart failure symptoms
b) stronger beliefs about a long and chronic illness duration (*Timeline*)
c) higher perceptions of serious *Consequences* of heart failure
d) weaker beliefs about *Personal Control*
e) weaker beliefs about the effectiveness of *Treatment Control*
f) lower perceptions of *Coherence* or understanding of heart failure

} will be related to lower levels of functional performance at follow-up.

Table 4. Hypotheses III and IV: Moderating Effect of Support and Conflict on the Relationships Between Illness Perceptions and Depression

III. Moderating Effect of Social Support on the Relationships Between Illness Perceptions and Depression

In patients with CHF, the magnitude of the relationships between illness perceptions at baseline and depressive symptoms at follow-up varies as a function of the level of *Support*, even after controlling for demographic and clinical covariates, and baseline depression.

Specifically, the magnitude of the relationship between :
IIIa. *Identity* perceptions and depression at follow-up
IIIb. beliefs about a long and chronic illness duration (*Timeline*) and depression at follow-up
IIIc. perceptions of serious *Consequences* of heart failure and depression at follow-up
IIId. beliefs about *Personal Control* and depression at follow-up
IIIe. beliefs about the effectiveness of *Treatment Control* and depression at follow-up
IIIf. perceptions of *Coherence* or understanding of heart failure and depression at follow-up

} varies as a function of the baseline level of *Support*, even after controlling for demographic and clinical covariates, and baseline depression.

IV. Moderating Effect of Conflict on the Relationships Between Illness Perceptions and Depression

In patients with CHF, the magnitude of the relationships between illness perceptions at baseline and depressive symptoms at follow-up varies as a function of the level of *Conflict*, even after controlling for demographic and clinical covariates, and baseline depression.

Specifically, the magnitude of the relationship between :
IVa. *Identity* perceptions and depression at follow-up
IVb. beliefs about a long and chronic illness duration (*Timeline*) and depression at follow-up
IVc. perceptions of serious *Consequences* of heart failure and depression at follow-up
IVd. beliefs about *Personal Control* and depression at follow-up
IVe. beliefs about the effectiveness of *Treatment Control* and depression at follow-up
IVf. perceptions of *Coherence* or understanding of heart failure and depression at follow-up

} varies as a function of the baseline level of *Conflict*, even after controlling for demographic and clinical covariates, and baseline depression.

Table 5. Hypotheses V and VI: Moderating Effect of Support and Conflict on the Relationships Between Illness Perceptions and Functional Performance

V. Moderating Effect of Social Support on the Relationships Between Illness Perceptions and Functional Performance

In patients with CHF, the magnitude of the relationships between illness perceptions at baseline and functional performance at follow-up varies as a function of the level of *Support*, even after controlling for demographic and clinical covariates, and baseline functional performance.

Specifically, the magnitude of the relationship between :
Va. *Identity* perceptions and functional performance at follow-up
Vb. beliefs about a long and chronic illness duration (*Timeline*) and functional performance at follow-up
Vc. perceptions of serious *Consequences* of heart failure and functional performance at follow-up
Vd. beliefs about *Personal Control* and functional performance at follow-up
Ve. beliefs about the effectiveness of *Treatment Control* and functional performance at follow-up
Vf. perceptions of *Coherence* or understanding of heart failure and functional performance at follow-up

varies as a function of the baseline level of *Support*, even after controlling for demographic and clinical covariates, and baseline functional performance.

VI. Moderating Effect of Conflict on the Relationships Between Illness Perceptions and Functional Performance

In patients with CHF, the magnitude of the relationships between illness perceptions at baseline and depressive symptoms at follow-up varies as a function of the level of *Conflict*, even after controlling for demographic and clinical covariates, and baseline functional performance.

Specifically, the magnitude of the relationship between :
VIa. *Identity* perceptions and functional performance at follow-up
VIb. beliefs about a long and chronic illness duration (*Timeline*) and functional performance at follow-up
VIc. perceptions of serious *Consequences* of heart failure and functional performance at follow-up
VId. beliefs about *Personal Control* and functional performance at follow-up
VIe. beliefs about the effectiveness of *Treatment Control* and functional performance at follow-up
VIf. perceptions of *Coherence* or understanding of heart failure and functional performance at follow-up

varies as a function of the baseline level of *Conflict*, even after controlling for demographic and clinical covariates, and baseline functional performance.

Table 6. Hypotheses VII and VIII: Associations Between Depression and Functional Performance

VII. The Influence of Depression at Baseline on the Relationships Between Illness Perceptions and Functional Performance at Follow-Up In patients with CHF, depressive symptoms at baseline partially account for the relationships between illness perceptions at baseline and functional performance at follow-up, even after controlling for demographic and clinical covariates, and baseline measures of functional performance.
VIII. The Influence of Functional Performance at Baseline on the Relationships Between Illness Perceptions and Depression at Follow-Up In patients with CHF, functional performance at baseline partially accounts for the relationships between illness perceptions at baseline and depression at follow-up, even after controlling for demographic and clinical covariates, and baseline measures of depression.

CHAPTER 3. METHODS

3.1 OVERVIEW OF THE STUDY DESIGN

A longitudinal study was carried out in 142 ambulatory CHF patients treated at the Heart Failure Clinic at the Montreal Heart Institute. Baseline psychosocial interviews, conducted face-to-face, included measures of depressive symptoms, functional performance, illness perceptions, social support, and other demographic and clinical characteristics. Four month follow-up interviews were carried out by telephone and included assessment of depressive symptoms and functional performance.

3.2 STUDY SAMPLE

3.2.1 INCLUSION AND EXCLUSION CRITERIA

Subjects included in the study were patients treated at the Heart Failure Clinic at the Montreal Heart Institute. They were recruited between March 12th 2002 and June 28th 2002, and between March 17th 2003 and May 5th 2003. The recruitment was carried out during two distinct recruitment windows, as the investigator was required to interrupt the recruitment due to a pregnancy leave. Study participants met the following inclusion criteria: 1) diagnosed with heart failure, based on a left ventricular ejection fraction (LVEF) of less than 40%, obtained from nuclear medicine studies, cardiac angiography, or echocardiography; 2) able to speak and read French or English, and ability to complete a one-hour long interview; 3) available for a clinic or home interview within 2 weeks of the initial contact and a follow-up telephone interview within 2 to 5 months after the first interview; and 4) willing to provide informed consent.

In order to increase homogeneity in the profile of patients sampled for the present study, the following factors were controlled by using them as exclusion criteria: 1) patients scheduled for a coronary artery bypass graft (CABG) surgery, patients with a concurrent major illness such as cancer, renal failure requiring dialysis treatment, or under investigation for a potential cardiac transplant, as these co-morbid conditions may represent additional stressful events which may influence patients' illness experience; 2) patients with cognitive or memory difficulties based on the clinical judgment of the investigator who conducted the interviews, and on the opinion of the clinic nurse; and 3) whenever the physician responsible at the Heart Failure Clinic judged that it was inappropriate for the patient to take part in the study.

Patients with a previous psychiatric history and patients participating in experimental trials were considered eligible for the present study. In addition, due to the descriptive nature of the study, patients' participation in the study did not prevent them from subsequently participating in other studies, unless the investigators of these studies required patients not to participate.

3.2.2 THE HEART FAILURE CLINIC

The Heart Failure Clinic at the Montreal Heart Institute was created in January 2000. The clinic offers CHF patients medical care support, nursing counseling, and support of a dietician and a psychiatrist, with appointments that vary in frequency, from monthly to biannually, according to patients' needs. Heart failure patients are referred to the clinic by cardiologists who evaluate the patients during a hospitalization, a visit to the emergency

room, or a visit at the outpatient clinic at the Montreal Heart Institute. The cardiologist's decision to refer a patient is based on the patient's New York Heart Association (NYHA) functional classification scheme (class III or IV), left ventricular ejection function (LVEF) (less than 40%), or on the need for an optimization of treatment and follow-up.

3.3 ETHICAL CONSIDERATIONS

The study protocol received approval from 1) the Research Ethics Board of the Montreal Heart Institute on February 14, 2002 and the consent of 2) the Director of Professional Services on February 12, 2002. Approval was given by the McGill University Institutional Review Board on March 20, 2002 (see Appendix B).

Patient's participation in the study was voluntary. Written informed consent was obtained from each patient recruited at the clinic (see Consent Forms in Appendix C), and was reaffirmed at the time of the baseline interview and the follow-up phone call. The patient was informed by the investigator of the purpose and the procedures involved in the study, including audio-taping of baseline and follow-up interviews. Informed consent also included the investigators' right to access the information contained in the data base of the Régie de l'assurance-maladie du Québec (RAMQ) and of the ministère de la Santé et des Services sociaux du Québec for the two years following the baseline interviews. These data will be obtained and analyzed subsequently to explore the morbidity and mortality associated with depression and illness perceptions among CHF patients.

The patient's questions and concerns were answered by the investigator. He or she was also informed that the decision whether to participate in the study would not affect the

subsequent care and services he or she received from the health care system. He or she was advised of his right to discontinue participation at any time without explanation or prejudice. Although the patient was encouraged to answer all the questions, he or she was also advised that he was not obliged to do so. Patient's confidentiality was strictly preserved. Numerical identification numbers were used on all instruments and in analyses, with the master list including patient's identification stored in a locked filing cabinet in the Research Center of the Montreal Heart Institute. The list will be destroyed once data analysis and the two-year follow-up (not part of this thesis) are complete. The study questionnaires will be kept locked at the Montreal Heart Institute for at least 10 years after the end of the study.

During informed consent procedures, the patient was advised that the results of the questionnaires were to be assessed following the interviews. If a patient scored high on the depression scale, or if he presented suicidal ideation, at either the baseline or follow-up assessment, the investigator informed the nurse caring for the patient at the Heart Failure Clinic. A score of greater than 100 was indicative of moderately severe depression, and represented the highest 15% of CHF patients in previous studies, according to the scale's author (Personal Communication, David Hare). A score of greater than 4 on the 7-point 'Strongly Disagree' to 'Strongly Agree' continuum of the suicidal ideation item on the depression scale, was indicative of suicidal ideation. The nurse and the physician at the clinic then decided whether to refer such patients for a more complete evaluation by a member of the Psychosomatic Medicine Department of the Montreal Heart Institute.

3.4 PROCEDURES

With the approval of the Director of the Heart Failure Clinic at the Montreal Heart Institute, potentially eligible patients were identified by the investigator through the Heart Failure Clinic's weekly appointment list. The investigator then reviewed their medical charts for data related to the exclusion/inclusion criteria of the study (see Recruitment Log in Appendix D). After assuring patient's eligibility, the investigator approached patients to explain the study, following their appointment at the clinic. If a patient consented to participate, written informed consent was obtained, and a psychosocial interview was planned at the hospital, within two weeks following the visit to the clinic. Obtaining written informed consent following the patient's appointment at the clinic allowed the patient to interact face to face with the investigator, and it was thought that this might increase the acceptance rate. If there was a problem with transportation or another reason that the patient could not return to the clinic for the psychosocial interview, the investigator offered to conduct the interview at the patient's home.

The investigator confirmed the appointment for the psychosocial interview by telephone the day before the interview. All the psychosocial interviews took place at the Montreal Heart Institute or the patient's home, and all interviews were audiotaped to assure adequate assessment of depression. Clinic-based interviews took place in a predetermined room at the clinic, during a day that no clinic appointments were scheduled (availability of 2 to 4 days per week). Following reconfirmation of consent, the oral interview included a demographic questionnaire (see Appendix E), followed by the psychosocial questionnaires (see Appendix F). In order of their administration, the psychosocial questionnaires included

the depression scale (Cardiac Depression Scale, CDS), the Revised Illness Perception Questionnaire (IPQ-R), the Interpersonal Relationship Inventory short form (IPRI), and the functional status questionnaire (Functional Performance inventory, FPI-SF). The administration of study questionnaires took approximately 90 minutes. Home-based interviews followed the same approach. In situations where the patient showed signs of fatigue during the interview, the interview was interrupted for a while and continued at a later time, or discontinued completely.

At 2 to 5 months following the patient's clinic-based interview, the investigator contacted the patient by telephone, and scheduled a follow-up telephone interview at a time when he could respond in privacy. The telephone interview lasted about 30 minutes, and only involved re-assessment of depressive symptoms and functional performance. The patient responded to the study questionnaires using an answer card, which was given to him at the time of the initial interview (see Answer Cards in Appendix G). As with the baseline interview, these interviews were audiotaped to assure adequate measurement of depression and to provide an original source of documention of patient's responses if the investigator forgot to note a patient's response.

3.5 MEASURES

3.5.1 PSYCHOSOCIAL MEASURES

Four psychosocial measures were used. The Cardiac Depression Scale (CDS), [187] a 26-item self-report instrument specifically designed for measuring depression in cardiac patients, was used to assess depressive symptoms. Functional performance was assessed

with the Functional Performance Inventory (FPI-SF), a 32-item self-report of functional performance in people with a chronic physical illness. Six selected subscales of the Revised Illness Perceptions Questionnaire (IPQ-R) comprising 44 items were used to assess the *Identity*, *Timeline* (acute/chronic), *Consequences*, *Personal* and *Treatment Control*, and *Coherence* domains that underlie patients' representations of illness [132]. Tilden's Interpersonal Relationships Inventory (IPRI), a 26-item self-report instrument divided into two subscales (*Support*, 13 items and *Conflict*, 13 items) was used to measure perceived *Support*, including the less often measured aspects of *Conflict*.[188] The sections that follow describe each psychosocial measure, its psychometric properties, and the reasons for selecting only some subscales for inclusion in the study.

3.5.1.1 Cardiac Depression Scale (CDS)

The Cardiac Depression Scale (CDS) [187] is a self-report instrument specifically developed for measuring depression in cardiac patients. The scale consists of 26 items divided into 7 subscales (sleep, anhedonia, uncertainty, mood, cognition, hopelessness, and inactivity). The items are based on a 7-point Likert-format with responses ranging from 'Strongly Agree' to 'Strongly Disagree'. The scale takes about five minutes to complete and less than one minute to score. Nineteen of the depression items are directly added, with the additional seven positively worded items requiring reverse scoring. Scores range from 26 to 182. Higher scores indicate more depressed mood. Scores of greater than 100 are indicative of moderately severe depression, and scores of greater than 125 are indicative of severe depression.

The CDS was developed by Hare et al.[187] who studied an Australian sample of 246 cardiac outpatients from a general cardiac clinic with a variety of diagnoses such as angina, heart failure, post-myocardial infarction, postsurgery, valve disease, and arrhythmias. The CDS was developed as a disease-specific measure of depression for cardiac patients. The author of the scale reported Cronbach's alpha reliability coefficient of .90, and a correlation coefficient of .73 with the BDI.[189] The frequency distribution of patient scores on the CDS formed a normal distribution for both sexes over a wide range of ages and cardiac diagnoses, which contrasts with the more skewed distribution of the patients' scores on the BDI reported in the same population. Test-retest reliability of the scale over 2 weeks after cardiac rehabilitation after MI or CABG yielded a correlation coefficient of .86. Content and face validity have been established by health professionals recognized for their wide-ranging expertise with cardiac patients, from the disciplines of cardiology, psychiatry, psychology, occupational therapy, physiotherapy, and cardiac nursing.

A recent validation study of the CDS, conducted in a UK cardiac population (n=396), recruited patients with MI, cardiac surgery, angioplasty, heart failure or angina, from two cardiac support group networks.[190] In this population, the CDS showed high internal reliability (Cronbach's alpha reliability coefficient of .93), stability over time (test-retest reliability coefficient of .79, over four to six weeks on a subsample, n=43), and strong correlations with the BDI (.79) and with the depression subscale of the HADS (.77). When compared with the two latter scales, the CDS showed a more normal distribution.

The CDS has been validated in English and German (Thai, Japanese, and Italian translations are currently being undertaken (D. Hare, personal communication, January 22,

2002). Previous work with the CDS has demonstrated the same seven factors in English and German, and we expect similar results with the French translation of the CDS, developed for the present study using the back-translation method. [191] Normative data for the CDS have been compiled in acute MI and CABG patients (n = 154), CABG patients (n = 90), general cardiac outpatients (n = 246), CHF patients (n = 54), and in elderly CHF patients (n = 83).[187]

The Cardiac Depression Scale (CDS) was chosen for the assessment of depression in the present study because it presents advantages in terms of the type of patients studied and for its sensitivity to statistical purposes. The CDS was specifically developed to measure depression in cardiac patients, while other measures of depression were developed mainly in psychiatric patients, and therefore, they usually produce a skewed distribution in cardiac patients.[189,187] The normal distribution of the scores on the CDS therefore suggests that this scale may be more sensitive at both extremes of the distribution, and this would allow capturing large variations in patients' scores.

3.5.1.2 Functional Performance Inventory (FPI-SF)

The Functional Performance Inventory (FPI) is a self-report measure of functional performance designed for use in people with various chronic illnesses. The FPI was based on an explicit analytical framework, on a critical review of existing instruments on functional status, and qualitative studies of the experiences of patients.[136,192] The FPI is designed to measure functional performance, that is, the degrees of difficulty with which activities are actually performed on a day-to-day basis.

The original FPI is a 65-item self-report instrument to assess body care, household maintenance, physical exercise, recreation, spiritual activities, and social activities. Two abbreviated versions of the original FPI were developed, a 32-item short form (FPI-SF) [193] and a 12-item FPI-Mini, [194] for situations in which a shorter instrument is desired and for studies that choose to use a univariate measure of performance rather than a profile of scores. In the present study we used the short form FPI-SF, because a shorter instrument was needed for the type of patients studied with reduced concentration. The section that follows describes the original 65-item FPI, and then presents the psychometric properties of the FPI-SF used in the present study.

The original FPI has 6 subscales to assess body care (9 items), household maintenance (21 items), physical exercise (7 items), recreation (11 items), spiritual activities (5 items), and social activities (12 items). The body care subscale includes activities motivated by personal bodily needs, such as dressing, showering and shaving or applying makeup. The household maintenance subscale includes activities involved in and around the house or apartment, such as grocery shopping, vacuuming, mowing the lawn, and going to appointments. The physical exercise subscale includes activities such as walking, swimming or bicycling. The recreation subscale includes activities performed for personal pleasure, such as shopping, going to the movies, and reading. The spiritual activities subscale includes activities such as reading, meditation, and attendance at religious ceremonies or worship services. The social interaction subscale includes activities involved in interaction with the community and family, such as attending parties, organizational meetings, volunteer work, visiting friends, and phoning relatives. All

subscales use a 4-point response choice that ranges from 1 (the activity can be performed easily, with no difficulty) to 4 (the activity is no longer performed for health reasons). An option *not applicable* allows the subjects to indicate whether an activity is not performed for reasons other than health. Subjects choose the number that best describes the level of difficulty associated with a target activity. No point is allocated for activities that are not performed, for health or other reasons. Scores on the remaining three options are reversed, so that high scores on the FPI reflect high functioning (3 points for activities that are performed with no difficulty; 2 points, some difficulties; and 1 point, much difficulty). Mean scores are calculated for the total scale.

The validity of the original FPI scale has been established in patients with chronic obstructive pulmonary disease (COPD). Items were derived through an in-depth review of the literature [195] complemented by interviews with 6 men and 6 women with moderate to severe COPD. [192] The activity profile and contextual descriptions that emerged from the qualitative data were used to develop and refine items that formed the substantive foundation for the FPI instrument. Because the FPI scale was developed among patients with COPD, and because both CHF and COPD share similarities in terms of symptoms and physical limitations, the FPI scale is a relevant scale for use with the CHF patient population. Twelve clinical nurse specialists and 12 scientists, recognized for their expertise in chronic lung disease through their research, publications, and practice, assessed the content validity. Based on this feedback, the items of the FPI were revised, clarified, and reorganized.

The FPI-SF abbreviated version was derived and tested using data from the original validation study, a cross-sectional mail survey of 154 male and female patients with COPD.[196] A subset (n=54) participated in 2-week test-retest reliability evaluation. Forty-one family members also participated in the validation process.

The FPI-SF abbreviated version is internally consistent, highly reliable, with strong evidence of content, concurrent, construct, and discriminant validity. The internal consistency was .93. Two-week test-retest reliability produced correlation coefficients of .88. Concurrent validity was evaluated by correlating the FPI-SF with similar instruments that assess performance. The FPI-SF was highly correlated with the performance component of the Functional Status Questionnaire (FSQ) (Activities of Daily Living, ADL, r=.70; instrumental ADL, IADL, r=.71) [197] and the Duke Activity Status Index (DASI) (r=.65) [198] The FPI-SF discriminated between patient groups according to perceived severity and activity limitation. Patients who perceived their disease and activity limitation as severe to very severe had significantly lower scores on the FPI-SF score than those who perceived their disease and activity limitation as mild to moderate (t=9.69, $p<.001$). The FPI-SF discriminated also between patients with a FEV_1% predicted (specifically percentage of predicted forced expiratory volume in 1 second) less than and greater than 1.0 liter (t=4.43, $p<.001$). A French translation of the FPI-SF was developed for the present study using the back-translation method.[191]

3.5.1.3 Revised Illness Perceptions Questionnaire (IPQ-R)

The Revised Illness Perceptions Questionnaire (IPQ-R) was developed to assess the dimensions of illness perceptions included in Leventhal's self-regulatory model [37,130] In the present study, we used six of the nine original subscales of the IPQ-R, and excluded the *Cause*, *Time Cyclical*, and *Emotional Representations* subscales. In the *Cause* subscale, patients rate a list of possible causes of their illness relating to personal ideas about etiology of their illness. Each of the possible causes is rated 1-5, with high scores indicating a strong belief that a given etiologic factor is important. Due to the varied nature of the etiological factors underlying heart failure, the use of the cause subscale which reduces to a single etiologic factor or single score is not appropriate with CHF patients. The *Time Cyclical* dimension was added in the revised IPQ-R to allow researchers working with patients whose illness cannot be adequately captured on a simple acute/chronic dimension, such as menstrual disorders and some autoimmune and skin conditions. Because heart failure is a chronic condition, it was felt that the *Timeline* (acute/chronic) subscale would be more appropriate in CHF patients. We also chose to assess only the cognitive components of illness perceptions, that is, *Identity*, *Timeline*, *Personal* and *Treatment Control*, *Consequences* and *Coherence* dimensions, and thus exclude the *Emotional Representations* dimension of the IPQ-R. According to Leventhal's self-regulatory model,[36] in response to illness and other health threats, people develop parallel cognitive and emotional representations which, in turn, give rise to problem-based and emotion-focused coping strategies, respectively. The emotional representations component was added in the revised IPQ-R in order to explore a series of affective responses. These eight items relate to how

the present illness makes the patient feel: anxious, angry, afraid, upset, worried, distressed, and depressed. In the present study, the relationships between illness perceptions and depression are explored; therefore the emotional representation dimension was excluded in order to avoid overlap of this emotional dimension with the depression scale. Finally, the IPQ-R was modified for use with CHF patients. The term "heart failure" was substituted for "illness" in each question as recommended by the authors of the IPQ-R.[130]

The first part of the IPQ-R measures illness *Identity*, or the matching of symptoms to an illness label. The *Identity* subscale consists of a series of 14 commonly experienced symptoms, with some of the symptoms being typical of heart failure (e.g. dyspnea) and others not (e.g., stiff joints). Patients are asked to rate whether or not they have experienced each symptom since their illness, and then to rate whether or not they believe the symptom to be specifically related to their illness. This second rating, about beliefs that experienced symptoms are part of CHF, are summed and form the illness *Identity* subscale. As was recommended by the authors of the IPQ-R, [132] the following symptoms specifically related to heart failure were selected based on previous studies of heart failure[151,154,199] and were added to the existing list, to tailor the scale to heart failure: palpitations, and swelling in the feet or ankles.

The remaining dimensions of the IPQ-R are rated on a 5-point Likert type scale, with answers ranging from strongly agree to strongly disagree. This provides separate scores for *Timeline*, *Consequences*, *Personal Control*, *Treatment Control* and *Coherence*. The *Timeline* (acute/chronic) subscale consists of six items, relating to the perceived duration of the illness. Each of the items is scored from 1 to 5, with low scores representing

a short perceived duration of illness. Two of the items are directly added, and two others require reverse scoring. Possible mean scores range from 5 to 20. The *Consequences* subscale consists of six items relating to beliefs about the severity and expected effects on outcome of the illness. Scores range from 11 to 55, with higher scores (sum over all items) indicating the perception of serious consequences of the illness. The *Personal Control* and *Treatment Control* subscales consist of six and five items respectively; scores range from 9 to 45, and from 6 to 35, with high mean scores indicating a belief about *Personal Control* and about the effectiveness of *Treatment Control*. The *Coherence* subscale consists of five items; scores range from 4 to 20, with higher scores indicating better understanding the illness and its symptoms.

The reliability and validity of the original IPQ scale has been established in various medical patient samples.[132] High internal consistency and test-retest reliability were reported for all the subscales. The authors reported Cronbach's alpha reliability coefficients of .75 for *Identity*, .89 for *Timeline* (acute/chronic), .84 for *Consequences*, .81 for *Personal Control*, .80 for *Treatment Control*, and of .87 for *Coherence*. Test-retest reliability of each subscale over a 3-week period was assessed among dialysis inpatients. All subscales of the IPQ-R showed moderate to good stability over this period with correlations ranging from .46 to .80. *Personal Control* was the only subscale to show a correlation less than .5. *Identity* beliefs remained the most consistent over this period. The stability of the IPQ-R over a longer period of six months was tested with a RA group. All the correlations between time one and time two data were greater than .5.

Validity of the revised IPQ-R scale was tested in a sample of 711 patients from 8 different illness groups: rheumatoid arthritis (n=76), diabetes (n=73), asthma (n=86), chronic and acute pain patients (n= 63 and 35), HIV (n=161), MI patients (n=47), and multiple sclerosis patients(n=170).[130] The concept of illness *Identity*, which is the process of matching symptoms to an illness label, is distinct from somatisation, the latter being the tendency to report symptoms. The symptoms experienced by the patients and that they also identified as linked to their illness, were shown to differ from those symptoms experienced but not linked to their illnsss, which suggests that *Identity* is a different conceptual construct from somatisation.

The IPQ-R demonstrated sound discriminant, divergent and criterion validity. Discriminant validity was assessed by comparing the illness beliefs of acute and chronic pain patients. Independent t-tests computed on each of the IPQ-R subscales showed differences in the expected direction. Chronic pain patients had higher scores on *Identity*, chronic and cyclical *Timeline*, more serious *Consequences*, but lower beliefs about *Personal Control*, and lower illness *Coherence,* compared to acute pain patients. Divergent validity was evaluated by comparing the IPQ-R subscales with the Positive and Negative Affect Schedule.[200] The Positive affect (PA) scale measures the degree to which a person feels enthusiastic, active, and alert, while the Negative affect (NA) dimension assesses subjective distress and discomfort. The correlations between the IPQ-R subscales and the PANAS were generally very small to moderate in size, and ranged between .17 and .35. Criterion validity was assessed by determining the extent to which the IPQ-R could predict adjustment to illness, as measured with the Sickness Impact Profile (SIP)[201] and the Fatigue

Severity scale [202] The *Identity*, *Control* and *Consequences* dimensions were significant predictors.

3.5.1.4 Interpersonal Relationships Inventory (IPRI)

Tilden's Interpersonal Relationships Inventory (IPRI) is a 39-item self-report instrument designed to measure perceived *Support*, including the less often measured aspects of *Reciprocity* and *Conflict*.[188] *Support* is defined as "perceived availability or enactment of helping behaviors by members of the social network." *Conflict* is defined as "perceived discord or stress in relationships caused by behaviors of others or the absence of behaviors of others, such as the withholding of help." *Reciprocity* is defined as the "perceived availability or occurrence of an exchange of emotional or tangible goods or services." (p.338).[188]

The IPRI consists of three subscales: *Social* (13 items), *Conflict* (13 items), and *Reciprocity* (13 items). In the present study, we used the short form of the instrument that excludes the *Reciprocity* subscale. Validity studies have shown that the *Reciprocity* subscale was not as strong psychometrically as the *Support* and *Conflict* subscales,[188] and therefore some investigators have not used it.[162,163,203] The *Reciprocity* subscale was excluded in this study also because of its high correlation with the *Support* subscale (between *Support* and *Reciprocity*: .75; *Support* and *Conflict* -.38; *Reciprocity* and *Conflict* -.27).

The short form of the IPRI consists of 26 items, each scored from 1 to 5. Items yield two scores, one for *Support* and one for *Conflict*. Fourteen items are based on a 5-point

agree-disagree continuum that ranges from 'Strongly Agree', 'Agree', 'Neutral', 'Disagree', to 'Strongly Agree'. These items refer to a perceived sentiment, such as "I can count on a friend to make me feel better when I need it". The remaining 12 items are based on a 5-point often-never continuum that ranges from 'Very Often', 'Fairly Often', 'Sometimes', 'Almost Never', to 'Never'. These items refer to the frequency of behavior, such as "I have trouble pleasing some people I care about".

Each of the *Support* and *Conflict* subscales provides a separate score, and the subscale scores are intended to be used separately, not combined. Subscale scores are obtained by summation of item scores. The *Support* subscale includes 11 agree-disagree and 2 often-never items, and the *Conflict* subscale includes 3 agree-disagree and 10 items. Each of the two subscales has scores ranging from 13 to 65.

Tilden et al. (1990) conducted extensive reliability and validity assessments of the IPRI.[188] The revised 39-item instrument was tested in successive steps with a total of 340 students, patients, and community residents for reliability and validity. Cronbach's alpha (internal consistency reliability coefficient) was .92 for *Support* and .91 for *Conflict*. The test-retest reliability over a two-week period was .91 for the *Support* subscale, and.81 for the *Conflict* subscale.

Content validity of items was judged by a panel of 11 experts involved in the development of the original 74-item version of the IPRI [204]. The underlying factor structure of the IPRI was assessed using an exploratory principal components factor analysis. Three factors were extracted, which together explained 47.5% of the variance. Strong evidence of

construct validity of the original IPRI was demonstrated using three forms of validity assessment (theory testing, contrasted groups, and multitrait-multimethod comparison).[188]

The French translation of the *Support* and *Conflict* subscales was completed by two independent individuals according to the back translation method.[191] Normative profiles of subscale scores for the general population show that levels of *Support* are comparable across the age span, but *Conflict* is significantly higher for adults in the 30 to 39 age period than for adults in the later life. Women tend to report significantly higher levels of *Support* and *Conflict*.[188]

3.5.2 DEMOGRAPHIC AND CLINICAL COVARIATES

Data on demographic and clinical covariates (age, marital status, and number of years of education) were obtained through patient interview and abstracted from the patient's chart. See Table 7 for a complete list of study variables and assessment times.

Clinical variables abstracted from the patient's medical chart included the etiology and severity of the patient's heart failure. The etiology variable classified CHF as to whether it was due to ischemic heart disease, valvular disease (post-valve replacement), idiopathic (no apparent cause of heart failure), and other (including alcoholic, hypertensive, or myocarditis cardiomyopathy). Etiology was collected for descriptive purposes only, and was not planned for inclusion in the analyses. Information on the severity of heart failure

Table 7. List of Study Variables as Originally Measured

Study Variables	Included in the Analyses	Baseline Measure	Follow-Up Measure	Instruments	Characteristic	Number of Items	Mode of Assessment
Dependent Variables							
Depressive Symptoms	√	√	√	Cardiac Depression Scale (CDS)	Continuous	26	Interview
Functional Performance	√	√	√	Functional Performance Inventory Short-Form (FPI-SF)	Continuous	32	Interview
Primary Independent Variables							
Illness Perceptions :				Revised Illness Perception Questionnaire (IPQ-R)			
- Identity	√	√		Subscale: *Identity*	Continuous	16	Interview
- Timeline (acute/chronic)	√	√		Subscale: *Timeline* (acute/chr.)	Binary	6	Interview
- Consequences	√	√		Subscale : *Consequences*	Continuous	6	Interview
- Personal Control	√	√		Subscale : *Personnal Control*	Continuous	6	Interview
- Treatment Control	√	√		Subscale: *Treatment Control*	Continuous	5	Interview
- Coherence	√	√		Subscale : *Coherence*	Continuous	5	Interview
Moderator Independent Variables							
Social Support:				Interpersonal Relationships Inventory (IPRI)			
- Social Support	√	√		Subscale : social support	Continuous	13	Interview
- Conflict	√	√		Subscale : conflict	Continuous	13	Interview
Demographic Covariates							
Age	√	√			Continuous		Chart review
Sex	√	√			Binary		Interview
Formal education	√	√			Categorical		Interview
Years of schooling		√			Continuous		Interview
Marital status		√			Categorical		Interview
Living Alone	√	√			Binary		Interview
Number of close friends		√			Continuous		Interview
Clinical Covariates							
Heart failure severity:							
- LVEF	√	√		Left Ventricular Ejection Fraction	Categorical		Chart review
- NYHA		√		New York Heart Association Class	Categorical		Chart review
- Etiology		√			Categorical		Chart review
- Comorbidity	√	√		Modified Charlson Comorbidity Index	Categorical		Chart review
- Number of visits at the Heart Failure Clinic during follow-up		√			Continuous		Chart review

included the New York Heart Association (NYHA) functional classification scheme and left ventricular ejection function (LVEF).

The NYHA classification provides a clinical assessment of the severity of heart failure symptoms based on the physician's impression of the degree of compromise or difficulty with shortness of breath and fatigue that patient have at rest or during activity.[47] The NYHA classification places patients into four categories: Class I (no symptoms), Class II (symptoms with ordinary activity), Class III (symptoms with less than ordinary activity), and Class IV (symptoms at rest).

While the NYHA classification is widely used as a clinical indicator of CHF severity, it is not always a reliable measurement nor is it a comprehensive account of the limitation experienced by heart failure. Previous authors have reported low validity and reliability assessments. The NYHA classification agreed with exercise tolerance treadmill testing in only 51% of patients, and assessment made by two physicians on the same patient gave similar results only 56% of the time.[205,206] Although NYHA class was collected to characterize the sample, it was not planned to be an analytical variable.

The LVEF is an objective measure of the ventricular function or mechanical performance of the heart. It is defined as the proportion of blood ejected in a single contraction of the heart in relation to the volume present at diastole. A normal LVEF ranges from 50% to 60% in healthy adults. Typically, a patient is considered to have systolic heart failure only when the left ventricular ejection fraction is less than 40%, whereas severe systolic dysfunction is characterized by a value less than 35%. This

assessment of the left-sided cardiac function was obtained from nuclear medicine studies, angiography, and echocardiography.

Data from the medical charts were also used to calculate the Charlson comorbidity index. [207] The index involves assessing the presence or absence of certain comorbid conditions as well as their severity (see Appendix H). Weights of 1, 2, 3 or 6 for each of the existing comorbid conditions are summed to derive a total score for each subject. The index includes the following conditions with their assigned weights (in parentheses): myocardial infarction (1), congestive heart failure (1), peripheral vascular disease (1), cerebrovascular disease (1), dementia (1), chronic pulmonary disease (1), connective tissue disease (1), ulcer disease (1), mild liver disease (1), diabetes (1), hemiplegia (2), moderate or severe renal disease (2), diabetes with end-stage organ damage (2), any malignancy (2), leukemia (2), malignant lymphoma (2), moderate or severe liver disease (3), metastatic solid malignancy (6), and AIDS (6).

The Charlson comorbidity index was originally developed as a predictor of one-year mortality in a cohort of inpatients on a medical service (n=559), and was tested in a second cohort of 685 patients with breast cancer during a 10-year follow-up. With higher level of the comorbidity index, there were stepwise elevations in the cumulative mortality attributable to comorbid disease.[207,208] The index was modified, as suggested by Aaronson et al. in their study of end-stage CHF patients, to exclude the CHF and myocardial infarction categories so that only noncardiac diseases remained.[209]

Data abstracted from the patient's medical chart also included: information on the number of past visits to the Heart Failure Clinic in the years preceding the baseline

interview and visits during the follow-up period; information on medications at baseline (the number of prescribed medications, and whether the patient received diuretics, nitrates, ACE inhibitors, digoxin, β-blockers, warfarin, amiodarone or amlopidine); and medications at the time of the follow-up interview. Finally, demographic and clinical information (age, sex, LVEF, NYHA, number of visits at the Heart Failure Clinic) on eligible CHF patients who refused or did not take part in the study were collected in order to determine the generalizability of the results.

3.6 STATISTICAL PLAN

The objectives of this study were to examine the relationships between baseline illness perceptions and depression and functional performance, and to explore the potential moderating effect of social support on the relationships between illness perceptions at baseline and depression and functional performance at follow-up. To achieve these goals, the statistical analyses were carried out in six stages.

1) The first section describes the psychometric evaluations that were carried out on the various psychosocial measures used in the study.
2) The second section presents the different statistical approaches to the dependent variables (depression and functional performance), which have been considered for the analyses. It involves a review of some of the statistical methods proposed in the psychiatric literature for the assessment of change. The two related concepts of reliability and errors in measurement are reviewed in the context of

the present study methodology, and a choice for the preferred approach for the dependent variables is presented.

3) The third section, on covariate control, justifies the choice of the demographic and clinical covariates that were used as covariate control for the regression analyses.
4) The fourth section presents the descriptive statistics used to characterize the study sample, and the assessment of change using different approaches to the dependent variables.
5) The fifth section, on cross-sectional analyses, presents the results of the correlational analyses that examined the degree of associations between all study variables. Next, unadjusted and adjusted correlational analyses are conducted to quantify the degrees of associations between the baseline psychosocial independent variables and both depression and functional performance, while controlling for the effect of the demographic and clinical covariates.
6) The sixth section, on longitudinal analyses, evaluates the primary hypotheses describing the main effect of illness perception variables on both depression and functional performance at follow-up; and a series of secondary hypotheses describing the moderating effect of social support on the relationships between illness perception variables and depression and functional performance at follow-up. Lastly, the influence of depression at baseline is examined on the relationships between illness perceptions and functional performance at follow-

up. And in the same way, the influence of functional performance at baseline is examined on the relationships between illness perceptions and depression at follow-up.

3.6.1 PSYCHOMETRIC EVALUATIONS OF THE PSYCHOSOCIAL MEASURES

Measuring instruments or scales are composed of a set of questions or items designed to measure a particular characteristic or attribute. Because the items should measure the same attribute, and not different parts of different attributes, it is desirable to see some relationship among items, and thus we anticipate that (1) each would be correlated with the total score, and (2) the items would be moderately correlated with each other. These two factors are measures of 'internal consistency'.

Internal consistency of the four psychosocial measures used in the present study was measured with the two common approaches, item-total correlations and Cronbach's alpha reliability coefficient. Item-total correlation coefficients above .20 are usually considered acceptable (Nunnally, 1978, p.288).[210] For the purposes of compatibility with other studies, we chose to retain all items in the psychosocial measures for the present study. A Cronbach alpha coefficient above 0.70 was considered adequate for each unidimensional scale and subscale (Nunnally, 1978, p.245).[210]

3.6.2 STATISTICAL APPROACHES TO THE DEPENDENT VARIABLES

The longitudinal aspect of the study was intended to better understand and capture the possible variations in depression and functional performance that could occur between

the two assessment times, and thus to examine how illness perceptions would relate to changes in depression and functional performance over time.

Research on the epidemiology of depression suggests that symptoms of depression fluctuate markedly in severity over time. These fluctuations may be influenced in part by physical health problems, and these fluctuations may even be more manifest when patients are seeking treatment for depression. In addition, all patients included in the present study were receiving nursing counseling at the clinic, and psychotherapy, and/or antidepressant treatment was available during the course of the study. In this context, it was anticipated that fluctuations in depressive symptoms would be observed over time. However, patients were at various stages of their illness, some were recently diagnosed with heart failure and thus received little medical support and nursing counseling from the clinic at the time they were included in the study, while others had been receiving treatments from the clinic for almost two years. Similarly, due to the chronic nature of CHF, it was also anticipated that some variations in functional performance over time would be observed. Lastly, because the study was carried out in the summer, a time of great vulnerability for CHF patients due to the limit imposed on fluid intake, it was anticipated that frequent exacerbation of symptoms due to edema and pulmonary congestion was likely to occur, which may further limit functional performance in these patients.

While trying to capture these variations or changes in depression and functional performance over time, it is important to recognize that other potential factors may also produce variations as a result of measurement errors or biases inherent in the

methodological design of the present study. These sources of undesired variations would obscure the assessment of 'real' changes in depression and functional performance.

Therefore, the statistical approach to the dependent variable used in the present study was planned to assess changes in depression and functional performance, while taking into account errors in measurement. As the notion of reliability of a measure refers to the concept of errors in measurement, the section that follows first presents a brief overview of the potential sources of error in measurement inherent in the present study methodology, and then addresses the selection of a statistical approach for the dependent variable that accounts for these undesired variations.

3.6.2.1 Reliability and Errors in Measurement

Measurement, in psychosocial research, often takes the form of a continuous variable or score, which attempts to quantify an abstract construct such as a behavior or an attribute. Such a continuous score will be obtained by rating scales completed by interviewers or by patients themselves. Because there is no 'gold standard' (perfect measuring instrument) for these abstract constructs, there will be variations inherent in any measurement, which are defined as measurement errors.

The concept of measurement error implies that any given measurement or score is usually conceptualized as a composite score that includes a true or fixed value, and an error component. By convention, it is assumed that the error component is distributed around the true value,[211] with the negative and positive errors balanced around the true value. These random errors of measurement are inconsistent and unpredictable errors. They will,

therefore, insert a certain amount of undesired variations into the true score, which can either increase or decrease the true score value. They can seriously limit the reliability of a given measure, and result in erroneous measurements.[212]

In the context of the present study, the dependent variables of interest (namely depression score or functional performance score) were measured twice, at baseline and at follow-up. Thus, measurement errors possibly acquired at each assessment time may have either underestimated or overestimated the true score, and consequently the true difference score for each subject. However, the present study used validated psychosocial questionnaires, with established reliability, which should have helped to reduce measurement errors. The more reliable a measurement is, the smaller the error component, and consequently, the more likely to find true variations in the scores between the two measurements.

Despite this, there are several other known and expected sources of random measurement errors inherent in the present study design, which used face-to-face interviews. They include biases in responding due to the personal and sensitive nature of the questions; patients may be reluctant to express their feelings or fear being judged; they may give socially desirable answers in an attempt to please the interviewer, or they may simply fail to understand some of the questions. Random errors of measurement can also occur as a result of the unpredictable factors associated with the individual being evaluated (i.e. personal characteristics such as motivation, fatigue, inattention, and concentration) and factors associated with the environment (such as noise and accessibility of the interviewing room). In order to keep these expected random variations at a minimum, the same

interviewer (the investigator), in a quiet environment, administered uniform structured interviews. Moreover, all interviews were recorded to provide the possibility of double-checking the patient's answer, if there had been transcription mistakes made by the interviewer when scoring a patient's response on the answer sheet.

3.6.2.2 Justification of the Approach for the Dependent Variable

Research on the assessment of change has traditionally been carried out at the group level, comparing the change observed in a single group (mean before vs after treatment), or the change between two groups (mean in the treatment vs mean in the control group), or the difference in mean change scores between two groups (mean change in the treatment vs mean change in the control group). However, because group mean comparisons use an estimate that is an average, such an assessment of change at the group level summarizes or aggregates all individual changes in a sample and therefore does not allow one to fully explore changes at the individual level. Intra-individual changes are much more informative in terms of identifying personal and psychological determinants of change. For this reason, the statistical approaches that were examined for the assessment of change in the present study were restricted to methods for intra-individual assessment of change.

DELTA CHANGE SCORE. The simplest approach for expressing change in an individual subject is by subtracting the score obtained at the first assessment from that obtained at a later assessment. Unfortunately, the use of a difference score does not account or correct for errors in measurement (reliability in the measure), including extremeness of scores. Since the difference score includes the measurement errors acquired at each

assessment, and in fact because these errors are random (for example, the errors may underestimate the true score at one assessment, but overestimate the true score at the following assessment), this will exacerbate errors for an individual subject. Therefore, an observed difference may reflect real change, but part of this change will be attributed to errors in measurement, and thus will not be real. For this reason, using a DELTA CHANGE SCORE as a measure of change can overestimate or underestimate the intra-individual differences between initial and follow-up scores.[211]

Although an important number of studies have used the DELTA CHANGE SCORE approach, and are still using these methods for assessing change,[213] this method has been criticized for its failure to adequately correct for measurement errors.[214]

Several alternative statistical methods have been proposed for assessing change; they specifically account for the effect of measurement errors and other systematic influences. The first class of these statistical methods includes Reliable Change (RC) indices, while the second class includes regression-based estimates of the difference score.

RELIABLE CHANGE INDEX. The RC index is a ratio, calculated by dividing an individual's change or difference score (difference between a patient's baseline score and follow-up score) by the standard error of the difference between the two scores (SE_{Diff}). In the denominator, the SE_{diff} "describes the spread of the distribution of change scores that would be expected if no real change had occurred." (Jacobson and Truax, 1991, p.14)[215]

The SE_{diff} is calculated from the standard error of measurement (SE_M) as

$$SE_{Diff} = [2(SE_M)^2]^{1/2}$$

and the SE_M can be obtained by the following formula:

$$SE_M = SD_1 [1-r_{xx}]^{1/2}$$

where SD_1 is the SD of all patients' baseline scores, and r_{xx} is the reliability of the measure. In a situation where reliability is measured in terms of a reliability index for individual measurements, the SE_M can be obtained directly from the individual measurements.

The more reliable the measurement is, the smaller the error component associated with it, and therefore the smaller the standard error of measurement (SE_M), and consequently the greater the chance for the RC index to identify true change.

For an individual subject, the RC index therefore translates the change score into a standardized score. The RC index attempts to determine the magnitude of change observed at an individual level, while expressing the change in terms of units of SE_M. The RC index has been referred to as the 'classical approach' of Jacobson and Truax (1991).[215] Maasseen (2000) [216] defined the RC index as "standardized normally distributed quantity," "The numerator contains the observed change for a given participant, corrected for the nuisance effects..." (p.623)

In the context of psychotherapy research, some authors have used the RC index as a criterion to identify patients as 'changed' or 'unchanged' on the basis of 'clinical significance'[217] Jacobson & Truax (1991) [215] defined clinically significant change as the extent to which therapy moves someone "outside the range of the dysfunctional population" (or two standard deviations beyond the mean of the dysfunctional population), or "within the range of the functional population" (or within two standard deviations of the mean of the functional population) (p.13) Jacobson & Truax (1991) further claimed that

when the RC index exceeds a critical value (for example set at 1.96), the RC index can be regarded as reflecting real change, i.e. a change that would be expected to be more than the undesired variations due to measurement error or the nuisance effect of some other factors.

However, the RC index and the 'clinical significant change' as defined by Jacobson & Truax [215], is in fact, nothing more than a standardized score, an observed change divided by a constant (the standard error of the difference scores). In this context, the RC index is not much different than the DELTA CHANGE SCORE. It only expresses change in another form. As with statistical testing, an RC index larger than 1.96 will occur in about 5% of cases, keeping in mind that an expected 5% of these RC can also reflect fluctuations of an unreliable instrument, for an alpha set at 0.05 (type I error). Therefore, the RC index does not provide any basis for defining or concluding what a clinically relevant change would be. Perhaps in response to this, and in an attempt to take into account the nuisance effects of several other factors, modified RC indices were proposed in the literature, which has regrettably led to increased complexity in the RC index and much confusion about its use.[218,219]

RESIDUAL CHANGE SCORE. The second class of statistical methods uses a linear regression estimate of the true difference score. In this approach, proposed by Cronbach and Furby (1970),[220] regression analysis is used to predict the final score of each patient from a regression line that relates the initial and the final scores. The predicted final score obtained by the linear regression therefore represents an estimate of the final score that would be expected if no treatment or other influence were operating to produce the observed difference between the initial and the final scores; in other words, the predicted

final score represents the expected value over many observations in the same person. An estimate of the true difference score, also called the 'residual gain score,' is calculated as the difference between the observed final score and the final score predicted linearly from the initial score. Thus, this method removes from the change score that "portion that could have been predicted linearly from pretest status" i.e. from the initial score (Cronbach and Furby, 1970, p. 74).[220] However, the portion that is removed may also include some real change in a subject, and for this reason, the residual change score is not a perfect way of correcting for errors in measurements.

Several more complex regression estimates have also been proposed. These use a regression estimate for the true initial score, or a regression estimate of the true difference from the observed difference.[221]

While the residual change score approach has been recognized by some as being justified and indicated in situations that require correction for measurement errors and other systematic effects, this approach has been criticized by many for being overly complex, often ambiguous, and not justified.[218,219,222] Moreover, when both the residual change approach and the reliable change method that corrects for practice effects are compared, some have shown that these methods produce different results,[216] or similar results.[223]

ADJUSTED FOLLOW-UP SCORE. In psychosocial research, it is common practice to use the initial score of the outcome as an adjustment variable in multiple linear regression analysis, in order to account for the baseline status of the outcome measure. In fact, the follow-up score adjusted for the baseline score, or ADJUSTED FOLLOW-UP SCORE, has a structure similar to the RESIDUAL CHANGE SCORE in that it provides an adjustment for the

initial score, and thus allows one to correct for the variance that is accounted for by the baseline score.

However, the ADJUSTED FOLLOW-UP SCORE presents an added advantage over the RESIDUAL CHANGE SCORE, in that it does not require an additional step in the calculation of the dependent variable used in the analysis, since the baseline score is used as an adjustment variable in the linear regression equation. More importantly, the ADJUSTED FOLLOW-UP SCORE allows for comparability with other studies that have used multiple linear regression health outcomes.

In conclusion, several statistical approaches for the assessment of change have been proposed in the psychiatric literature. These approaches differ in complexity and in the way they attempt to account for the effect of errors of measurement. The more complex methods were developed in response to the poor reliability and practice effects that are inherent in several cognitive and neuropsychological tests. [214] In the present study, it is unlikely that these practice effects would have come into play, in part because such effects are less relevant in the assessment of mood compared to cognitive function. In addition, since the degree of practice effect is dependent on the length of the test-retest interval (with the shorter intervals having the highest effects), in the present study, the delay of more than two months between the baseline and follow-up assessments would reduce the probability of observing such an effect.

Moreover, the diversity of the methods in the literature used for assessing change has regrettably resulted in different interpretations and conclusions regarding the assessment of change. In the absence of a clear consensus on the appropriate method for

assessing change, and in light of the number of subtle statistical controversies surrounding the residual change approach recently published,[216] a simpler approach for the assessment of change that provides an adjustment for the baseline measure, and that also allows for comparability of results with similar studies is probably the best choice. We therefore proposed to use the follow-up score in a multiple linear regression model while adjusting for the baseline score of the dependent variable as an independent variable in regression analysis (ADJUSTED FOLLOW-UP SCORE). In order to compare these results with multiple linear regressions involving both the DELTA CHANGE SCORE and the RESIDUAL CHANGE SCORES, all three approaches to the dependent variables were used in the analyses.

3.6.3 COVARIATE CONTROL

The purpose of this study was to examine the relationships between illness perceptions and social support at baseline, and depression and functional performance at follow-up. Multiple linear regression analyses were used to quantify the contribution of these psychosocial independent variables, while controlling for the effect of other factors. These factors included a limited subset of demographic and clinical covariates, identified a priori for inclusion in the regression analyses.

The approach for selecting factors for covariate control was based on substantive knowledge of their possible associations with both the dependent variables and the psychosocial independent variables, and thus on their potential effect as confounders for the association of interest. The inclusion of these factors in the analyses therefore was based on the existing literature, rather than on statistical significance.[224-226] Moreover, as

the common practice of univariate prescreening of the predictor variables for inclusion in the analyses is less desirable, multiple regression models in which the variables are predetermined a priori would substantiate the results and also yield results that would more likely be reproducible in other samples.[227]

Research on the etiology of depression in community samples [31-33]and studies with cardiac patient samples suggest that age, being separated or divorced, having lower educational levels, and comorbidity, are important correlates of depression and functioning.[29,81,89] Age, education and comorbidity have also been identified as correlates of illness perceptions in other studies of chronic illnesses.[44,228] As these demographic and clinical variables may contribute to variations in depression and functional performance, including them in the analyses would allow for better exploration of the associations of interest. Therefore, these covariates were force-entered into the regression analyses.

The available research on adjustment to cardiac disease suggests that the experience of women may be different from men, although very few studies have specifically examined these sex differences. This may be partly attributed to the fewer women included in these studies, often due to the lower prevalence of cardiac disease among women compared with men. The incidence of CHF is higher in men compared with women in every age group. This resulted in more men attending the Heart Failure Clinic at the Heart Institute at the time where the study was conducted. Thus, it was anticipated that there would be fewer women in the present study, which precludes accurate assessment of sex differences in relation to illness perceptions and depression. It must therefore be acknowledged that including women in the analyses may lead to an estimated relationship

that is an "average" of the sex-specific relationships. Nevertheless it was decided to include women in all analyses.

In summary, the demographic and clinical covariates that were measured and selected for covariate control in the analyses were age, sex, education, living alone, LVEF and the Modified Charlson Comorbidity Index.

3.6.4 DESCRIPTION OF VARIABLES

Descriptive statistics were calculated for all psychosocial variables, the demographic and the clinical covariates, to examine missing values, to evaluate the accuracy of the values, and to explore potential univariate outliers. For all continuous variables, means, standard deviations, medians, skewness, kurtosis, minimum and maximum values were inspected for plausibility (whether they were within plausible range for each variable or whether they were the result of an incorrect scoring) and for extreme values. Univariate outliers for all continuous variables were inspected by graphical methods (stem-and-leaf and box plots) as well as by inspection of z scores.

Frequency tables for discrete demographic and clinical variables were examined. Univariate outliers among dichotomous variables were identified as those scores in the smallest category of a very uneven split between the two categories. Similar related variables, such as years of education (continuous variable) and formal education (categorical variable) were compared with cross tabulation tables to identify possible discrepancies between variables. The distributions of all variables were obtained to characterize the study sample.

3.6.5 CROSS-SECTIONAL ANALYSES

Unadjusted correlational analyses using Pearson correlation coefficients were produced to examine the degree of association between all pairs of study variables, the psychosocial independent variables (*Identity*, *Timeline*, *Consequences*, *Personal* and *Treatment Control*, *Coherence*, and *Support* and *Conflict*), the demographic and clinical covariates (age, sex, education, living alone, LVEF and Modified Charlson Comorbidity Index), and both depression and functional performance.

Multiple linear regression analyses were carried out, first conceptualizing the data initially, cross-sectionally, and second, longitudinally. In the cross-sectional analyses, adjusted correlational analyses, using partial correlation coefficients, were calculated to measure the degree of association among the baseline psychosocial independent variables with both depression and functional performance, after controlling for the demographic and clinical covariates. The interrelationships among the psychosocial independent variables and the dependent variables were examined with two-tailed tests.

All statistical analyses were carried out with the SPSS for Windows statistical software package (Statistical Package for the Social Sciences) Graduate Pack Release 12.0 for Windows. All tests were 2-tailed with the 0.05 level considered significant. Histograms and normal probability plots of the residuals were examined to assess the assumptions of the multiple linear regressions (normality, linearity and homoscedacity).

3.6.6 LONGITUDINAL ANALYSES

In the longitudinal analyses, the baseline psychosocial variables (illness perceptions and social support) were used as predictor variables for the dependent variables (depression and functional performance at follow-up). Multiple linear regression analyses were conducted to assess the proportion of variance in the dependent variables (depression and functional performance at follow-up) that could be explained by the psychosocial independent variables (baseline illness perceptions and social support), while adjusting for the demographic and clinical covariates and the baseline measure of the dependent variables (depression and functional performance at baseline).

In the longitudinal analyses, three approaches were used to account for the effect of the baseline scores on the dependent variables: by subtracting the baseline score from the follow-up score (DELTA CHANGE SCORE), by using a predicted final score obtained by the linear regression that relates the baseline and the final scores (RESIDUAL CHANGE SCORE), or by using the baseline score as an adjustment variable in the regression analysis (ADJUSTED FOLLOW-UP SCORE) (see Table 8). Since the later two approaches (the RESIDUAL CHANGE SCORE and the ADJUSTED FOLLOW-UP SCORE for the baseline score) shared the characteristic of adjusting for the baseline measure of the dependent variable, it was anticipated that they would yield similar results.

Although we anticipated some intra-individual change in depression and functional performance over time (either improvement or worsening in depression and

Table 8. Approaches to the Dependent Variables Depression and Functional Performance According to the Models of Analysis

Approaches to the Dependent Variable	**Dependent Variable**	**Baseline Independent Variables**	**Use of the Baseline Score***
LONGITUDINAL ANALYSES			
1) DELTA CHANGE SCORE	$Y_2 - Y_1$	Illness Perceptions, Social support	Subtracted from the follow-up score
2) RESIDUAL CHANGE SCORE	$Y_2 - E[Y_2\|Y_1]$	Illness Perceptions, Social Support	Incorporated into a linear regression estimate of the follow-up score
3) ADJUSTED FOLLOW-UP SCORE	Y_2	Illness Perceptions, Social Support	Used as an independent variable
CROSS-SECTIONAL ANALYSES			
4) FOLLOW-UP SCORE	Y_2	Illness Perceptions, Social Support	No adjustment
5) BASELINE SCORE	Y_1	Illness Perceptions, Social Support	No adjustment

* In addition to an adjustment for the demographic and clinical covariates.
Y_2 : Depression or functional performance follow-up score;
Y_1: Depression or functional performance baseline score;
$E(Y_2|Y_1)$: Depression or functional performance follow-up score predicted by the regression of Y_2 on Y_1

functional performance over time), in the event that no change was identified at the individual level the results from the regression analyses using the RESIDUAL CHANGE SCORE and the ADJUSTED FOLLOW-UP SCORE would not present the benefit of longitudinal analyses. These benefits were described earlier in terms of identifying personal and psychological determinants of intra-individual changes.

3.6.6.1 Main Effect of Illness Perceptions

Two groups of primary hypotheses describing the main effect of baseline illness perceptions on both depression and functional performance at follow-up were assessed after controlling for the potential confounding influences of demographic and clinical covariates. As an initial step, the baseline measure of the dependent variable was forced into the regression, followed by the demographic and clinical covariates. Next, the contribution of each illness perception variable at baseline was explored using a partial *F* test. For example, one such partial *F* test assessed whether the addition of the variable *Identity Perception*, significantly contributed to explaining an additional proportion of the variance in depression at follow-up, given the presence of other demographic and clinical covariates, and the baseline measure of depression were already in the model.

3.6.6.2 Moderating Effect of Social Support

The potential moderating effects of social support on the relationships between baseline illness perceptions and both depression and functional performance at follow-up were assessed while controlling for the potential confounding influence of the demographic

and clinical covariates, and the baseline measure of the dependent variables. Product terms involving the two domains of social support (*Support* and *Conflict*) with the illness perception variables (see Group 1 and Group 2 interaction terms in Table 9) were created to describe the interaction between social support and illness perceptions. The significance of each interaction term was assessed by using partial *F* tests (variable added-last approach), after forcing the independent variables involved in these interaction terms into the model, in addition to the demographic, clinical covariates, and baseline measure of the dependent variable. For example, the partial *F* test for the product term combining the *Conflict* with *Identity*, assessed whether or not the magnitude of the relationship between *Identity Perceptions* and depression at follow-up varied as a function of patients' perceived level of *Conflict*, after controlling for the effect of demographic, clinical covariates and the baseline measure of depression.

3.6.6.3 Longitudinal Association Between Depression and Functional Performance

Since depression is known to increase the risk for subsequent physical disability, the relationships between illness perceptions and functional performance at follow-up might occur because illness perceptions are associated with depression at baseline. Therefore, the influence of baseline depression in the relationship between illness perceptions and functional performance among CHF patients was evaluated. In particular, we were interested in whether depressive symptoms at baseline partially account for the relationships between illness perceptions at baseline and functional performance at

Table 9. List of Study Variables Included in the Analyses

STUDY VARIABLES	CHARACTERISTICS
Dependent Variables	
Depressive Symptoms	Continuous
Functional Performance	Continuous
Demographic Covariates	
Age	Continuous
Sex	Binary
Living Alone	Binary
Formal Education	Binary
Clinical Covariates	
LVEF	Four indicator variables
Modified Charlson Comorbidity Index	Two indicator variables
Primary Independent Variables	
Illness Perception Variables:	
Identity	Continuous
Timeline	Binary
Consequences	Continuous
Personal Control	Continuous
Treatment Control	Continuous
Coherence	
Moderator Independent Variables	
Social Support:	
Support	Continuous
Conflict	Continuous
Interaction Terms	
Involving *Support*	
Support X *Identity*	Continuous
Support X *Timeline*	Continuous
Support X *Consequences*	Continuous
Support X *Personal Control*	Continuous
Support X *Treatment Control*	Continuous
Support X *Coherence*	Continuous
Involving *Conflict*	
Conflict X *Identity*	Continuous
Conflict X *Timeline*	Continuous
Conflict X *Consequences*	Continuous
Conflict X *Personal Control*	Continuous
Conflict X *Treatment Control*	Continuous
Conflict X *Coherence*	Continuous

follow-up, even after controlling for demographic and clinical covariates, and baseline measure of functional performance.

A partial *F* test was used to assess whether illness perceptions at baseline still explained a significant proportion of the variance in functional performance at follow-up, given that depression at baseline was already in the model, as well as other demographic and clinical covariates, and the baseline measure of functional performance.

In a similar way, the influence of functional performance at baseline on the relationships between illness perceptions and depression at follow-up was evaluated, after controlling for functional performance at baseline, and the other demographic and clinical covariates, and the baseline measure of depression.

3.7 SAMPLE SIZE JUSTIFICATION

The sample size estimate was based on several factors, including the effect size to be detected (defined as the proportion of variance in depressive symptoms and/or functional performance at follow-up, accounted for by the targeted independent variables). It also took into account the number of independent variables to be considered in the multivariate statistical models including adjustment for a series of demographic and clinical covariates (see Appendix I).

We assessed the ability of several correlates of depression and/or functional performance at baseline, to explain the variation in depressive symptoms and variation in functional performance measured at follow-up. Correlation analyses and multiple linear regressions were used. The alternate hypothesis for each outcome was expressed in terms

of proportion of variance in depressive symptoms and/or proportion of variance in functional performance at follow-up (the dependent variables) accounted for by the variables under study (the independent variables), i.e., as an R^2, or partial R^2. These R^2 values were expressed in terms of f^2 values, which represent the effect size index, i.e., the proportion of variance in depressive symptoms and/or functional performance accounted for by some independent variables relative to the proportion of error or residual variance, a population signal-to-noise ratio ($f^2 = PVs / PV_e$). Many of the effect sizes encountered in behavioral science are of medium effect, with $f^2 = .15$ (where $f^2 = .02$ for small, and $f^2 = .35$ for large effect size), and thus, it was anticipated that there could be a similar effect. In proportion of variance terms, this amounts to an r or partial r of .36, hence R^2 or partial $R^2 = .13$.

The determination of sample size took account of values of the noncentrality parameter λ, which are then used to find the necessary sample size N, at a given power for the F test of the null hypothesis for a set of independent variables at a fixed significance level. According to power tables for multiple regression and correlation analysis, a sample size of 120 subjects will achieve a power of 80% to detect a medium effect size ($f^2 = .15$; and $R^2 = .13$), using a set of 8 psychological variables and 6 demographic and clinical covariates, and a two-sided hypothesis test with a significance level of 0.05 (Cohen, 1977, p. 449).[230] Previous studies of CHF patients reported a drop-out rate of 15.8% and 20% [29,154] and therefore we planned to recruit an additional 22 subjects, for a total of 142 subjects.

CHAPTER 4. RESULTS

This chapter includes four major sections: the preliminary analyses, the description of the study sample, and the results of cross-sectional and longitudinal analyses. In the first section on preliminary analyses, the data set is examined for missing data and potential outliers, the variables are defined for the analyses, and the psychometric evaluations of the psychosocial measures are presented. The second section describes the demographic and clinical characteristics of the study sample, including all psychosocial measures. The third section, on cross-sectional analyses, examines the degree of association between all study variables, using unadjusted and adjusted correlational analyses controlling for the effect of demographic and clinical covariates, with partial correlation coefficients. The fourth section, on longitudinal analyses, evaluates the primary hypotheses describing the main effect of illness perception variables on both depression and functional performance at follow-up, and the secondary hypotheses describing the moderating effect of social support on the relationships between illness perception variables and depression and functional performance at follow-up. The association between depression at baseline and functional performance at follow-up, and the association between functional performance at baseline and depression at follow-up are examined last.

4.1 PRELIMINARY ANALYSES

4.1.1 ASSESSMENT OF MISSING DATA AND UNIVARIATE OUTLIERS

Psychosocial variables, demographic and medical covariates were initially examined for missing values and potential outliers. Six missing values for the psychosocial

questionnaires were found: one item was missing in the baseline depression questionnaire, and five items were missing in the illness perceptions questionnaires (one item in the consequences dimension, one in the coherence dimension, and three items were missing on the identity dimension for a single subject). These missing values were assigned the subject's average score for answered items within each scale or subscale.

A single missing value was found in the demographic covariates. The categorical variable labeled 'formal education' was missing for one subject. This missing value was assigned a value of five, which indicates 'high school completed,' based on the answer that this subject provided on another variable 'years of schooling', a continuous variable, a score of ten for this latter variable. No other missing values were found for any other demographic or clinical covariate.

There were several extreme values on seven of the psychosocial variables and on seven of the demographic and clinical covariates. Although these values appeared either very low or very high, they were within plausible range for these continuous variables, and therefore these values were retained in the analyses.

4.1.2 PSYCHOMETRIC EVALUATIONS OF THE PSYCHOSOCIAL MEASURES

4.1.2.1 Reliability of the Cardiac Depression Scale (CDS)

Cronbach's alpha reliability coefficients for the CDS 26-item scale were 0.90 at baseline and 0.90 at follow-up; these represent relatively high coefficients that are in the acceptable range as proposed by Streiner and Norman (2003).[211] The observed coefficients

in the present study were very similar to the coefficient reported by the authors of the scale of 0.90,[187] and that reported in a recent validation study of 0.93.[190]

In the present study, item-total correlations ranged from 0.27 to 0.66 for baseline and from 0.15 to 0.70 for follow-up depression, with the lowest correlations found for these two items: "I may not recover completely" (0.15 at baseline and 0.36 at follow-up), "The possibility of sudden death worries me" (0.27 at baseline and 0.28 at follow-up). These lower item-total correlations may reflect random, as well as true variations in the measurement. In the context of an end-stage disease such as CHF, recovery may have different meanings for different patients depending on how they view the course of their illness, and how they interpret the absence of symptoms.

The CDS scale has been validated in English and German in various cardiac patient populations, but the current study was the first use in French. Therefore, validation of the French translation of the CDS was carried out using a factor analysis procedure with principal component analysis and varimax rotation. Factor analysis of the French translation of the CDS produced seven factors, with the content of these factors being nearly identical to that of the original seven factors of the English language version described by the author of the scale.[187] The scree plots found in a recent validation study of the CDS[190] and the fact that our study clearly showed a one-factor scale, both support the use of the scale as a unidimensional construct, as was recommended by the author of the scale. The results of these analyses suggested that the French translation of the CDS is an appropriate and valid measure for measuring depression in the present study.

4.1.2.2 Reliability of the Functional Performance Inventory (FPI-SF)

Cronbach's alpha reliability coefficients for the FPI-SF scale were .86 at baseline and .86 at follow-up. The authors of the scale have reported an alpha coefficient of .93.[193] Item-total correlations ranged from .18 to .63 at baseline and from .04 to .61 at follow-up. The two items with very low item-total correlations were "Personal reading, meditation, or prayer" (.20 at baseline and .04 at follow-up), and "Visits from spiritual friends or teachers" (.18 at baseline and .09 at follow-up). It is unlikely that these low item-total correlations reflect translation problems; they may reflect different interpretations by the different subjects. Because item-total correlations for these two items very from baseline to follow-up, and for reasons of comparability with other studies that have used the FPI-SF with the same number of items, we decided to retain all items.

Factor analysis of the French translation of the FPI-SF produced six factors that agreed with the factor structure of the original FPI English language version, although some items were loading on more than one factor. The scree plot clearly showed a one-factor scale, which suggested that scoring of the scale as a whole would be an appropriate way to use the scale.

4.1.2.3 Reliability of the Illness Perceptions Questionnaire (IPQ-R)

Cronbach alpha reliability coefficients and item-total correlations for each of the six subscales of the second revised version of the IPQ-R used for this study are presented in Table 10. Alpha coefficients ranged from .65 for the *Treatment Control* dimension to .87 for the *Timeline* dimension. Item-total correlations ranged from .16 to .82, with the lowest

item-total correlations found in the *Identity* dimension for the item "Weight Loss." This low correlation coefficient may suggest that patients in the sample responded differently as to whether this symptom, when experienced by patients, can be attributed to CHF.

Pearson correlation coefficients computed between each of the subscales are presented in Table 11. Nine out of 21 correlation coefficients between the subscales were greater than .20, while all others were relatively low; this finding supports the use of the various subscales independently. As anticipated, *Personal Control* and *Treatment Control* had the highest association (r = .58); the others were *Identity* (according to patients' model or the medical model) and *Consequences* (r=.41; r=.39), *Consequences* and *Timeline* (r=.36), *Personal Control* and *Coherence* (r=.32), *Treatment Control* and *Coherence* (r=.29). Patients who reported high levels of belief in *Personal Control* also reported similarly high levels of belief about how controllable they felt their heart condition was with their treatments. Patients who reported high levels of belief that their heart condition would last a long time also believed in the seriousness of the *Consequences* of their illness on their lives.

4.1.2.4 Reliability of the Interpersonal Relationship Inventory (IPRI)

Cronbach's alpha reliability coefficient for the IPRI were .85 for the *Support* subscale (13 items in the subscale) and .81 for the *Conflict* subscale (13 items in the subscale). These alphas suggest a high level of homogeneity within each subscale. They are comparable to those reported by the authors of the scale, which ranged from .92 for the

Table 10. Cronbach's Alpha Reliability Coefficients for the Illness Perception Subscales (IPQ-R) (44 items)

Scale and subscale	Number of items in each subscale	CRONBACH'S ALPHA	ITEM-TOTAL CORRELATION (range within subscales)
Illness Perceptions			
Identity	16	.69	.16 - .42
Timeline	6	.87	.38 - .82
Consequences	6	.68	.23 - .58
Personal Control	6	.77	.44 - .63
Treatment Control	5	.65	.34 - .56
Coherence	5	.79	.41 - .67

Table 11. Pearson Correlation Matrix for the Illness Perceptions Subscales (IPQ-R) (44 items)

Subscales	*Identity* 1	*Timeline* 2	*Consequences* 3	*Personal Control* 4	*Treatment Control* 5	*Coherence* 6
1 *Identity*	---	.23	.41	-.01	-.13	-.08
2 *Timeline*		---	.36	-.05	-.16	.15
3 *Consequences*			---	-.07	-.08	-.16
4 *Personal Control*				---	.58	.32
5 *Treatment Control*					---	.29
6 Coherence						---

Support and .91 for the *Conflict* subscales.[188] Item-total correlation coefficients ranged from .34 to .65 for the *Support* subscale and from .18 to .58 for the *Conflict* subscale. These correlations suggest that each item in a scale is moderately correlated with the total scale, and within an acceptable range. The lowest item refers to the following statement "I spend time doing things for others when I'd really rather not," while all other items for that subscale have item-total correlations above .32. The Pearson correlation coefficient between the *Support* and the *Conflict* subscales was .28, which supports the use of each subscale independently.

4.1.3 DEFINING VARIABLES FOR ANALYSES

The distribution of the *Timeline* dimension of illness perceptions suggested a bimodal distribution of the values, above or below the value 26. This variable was therefore split into two categories, values below 26 and values greater or equal to 26. The resultant binary variable had a split of 72 and 70 (on frequency counts). This binary form of the variable was therefore used in the analyses. All other continuous variables were used in their original form (as continuous) in the analyses.

The variable Marital Status, a 6 level categorical variable (single, living with someone, married, separated, divorced, or widowed), provided information on the nature of the actual partner or on the nature of the relationship. Almost 54% of the values were in the 'married' category, and therefore categories were regrouped on the basis of the presence or absence of an actual partner. The binary form of the variable Marital Status was then cross tabulated with the variable Living Alone, and very few discrepancies were identified. The

variable Living Alone was retained for the analyses, as this variable reflects the presence or absence of a living partner, children or roommate; and the variable Marital Status was used for descriptive purposes only.

The variables Number of Close Friends and Number of Close Friends that Patients See or Speak with Once a Month, provided information on the density or the size of the supportive network. Although these variables represent an assessment of social support, the IPRI was selected as a measure of "perceptions of support" rather than these former variables that reflect the "density of the supportive network." More importantly, the IPRI allows evaluation of both the concepts of *Support* and *Conflict* in the relationship. Therefore, the variables Number of Close Friends and Number of Close Friends that Patients See or Speak with Once a Month were both used for descriptive purposes.

The variable Formal Education, an eight level categorical variable, ranged from 'some years in elementary school' to 'completed university second cycle'. A different variable, Years of Schooling, targeted the specific number of years of education a subject had accomplished. In order to choose a variable that would best describe the profile of education of the patients, values for these two variables were compared. Results of the cross tabulation revealed some discrepancies between the values for Years of Education (a continuous variable) and the relevant categories in Formal Education (the categorical variable). Discrepancies were found for 6 subjects who had reported the number of years on the continuous scale compared to the categorical variable, and 5 that had underestimated the number of years. Based on the results of the cross tabulation, the categorical variable Formal Education was retained for the analyses. Categories on that variable were regrouped

in order to create a binary form of that variable, with the following categories, 'Completed high school' and 'Did not complete high school'.

Patients were included in the study if they had a LVEF less than 40%. In the sample, LVEF ranged from a low of 10% to a high of 39%. However, its distribution showed clusters of values at regular intervals, a rounding pattern that suggested a categorical variable at regular splits of 5 units between categories. In the present study, data on LVEF was obtained from nuclear medicine studies, angiography, and echocardiography exams. The diversity of these measures may account in part for the pattern of variation observed in LVEF. More importantly, in contrast to nuclear medicine studies and echocardiography exams in which measurements of LVEF are obtained from computer programs, LVEF obtained through angiography exams are most often determined by visually assessing the contracting heart. The regular splits between categories and the clusters of values for LVEF may therefore reflect rounding, or an approximation of the function that is being estimated, and therefore artificial categories.

Thus, as the categories appeared to be distinct from each other, and in order to fully incorporate LVEF into regression analysis in case of nonlinear relation with the dependent variable, indicator variables for LVEF were created. Each indicator variable represented exactly one category of the original variable by assigning one to all observations in this category and zero to all other categories. Therefore, four indicator variables were created for a 5 level categorical LVEF variable.

The variable NYHA classification, a four level categorical variable (class I to IV), provided a clinical assessment of the severity of heart failure symptoms, based on the

physician's subjective impression of patients' symptomatology. The majority of the subjects had been categorized in class II (45%) and class III (52%) heart failure. In order to use this variable for descriptive purposes as planned, categories were combined into two groups, class I and II, and class III and IV.

The variable Etiology of Heart Failure was a four level categorical variable on a nominal scale with mutually exclusive categories. While the majority of subjects had an ischemic etiology of heart failure (73%), a binary form of this variable was created to contrast "ischemic" versus "valvular, idiopathic or other" etiology, to describe the study sample.

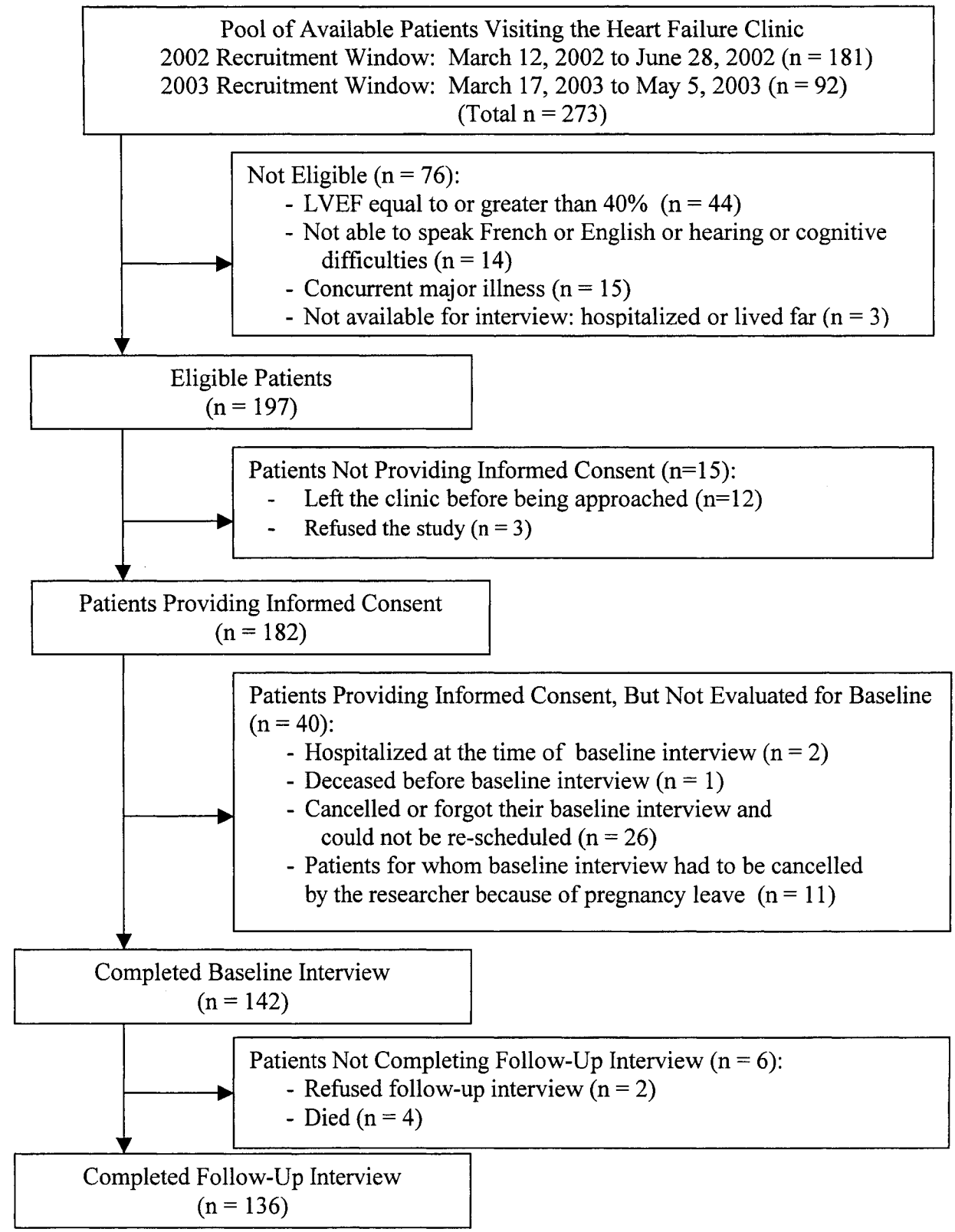
The Modified Charlson Comorbidity Index, [207] was used in the analyses while excluding ischemic or heart failure comorbidities. Studies that have used this index have reported the index as a continuous variable, but most often as a categorical variable, with the first category of "no comorbidity".[208,231] In the present study, two indicator variables were created, classifying the index into "1 comorbid condition", and the second indicator variable for "2 or more comorbid conditions".

4.2 DESCRIPTION OF THE STUDY SAMPLE

4.2.1 DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

The study sample consisted of ambulatory CHF patients treated at the Heart Failure Clinic at the Montreal Heart Institute. A total of 273 patients were screened for eligibility during two distinct recruitment windows, the first from March 12th 2002 to June 28th 2002, and the second from March 17th 2003 to May 5th 2003 (see Figure 1). Recruitment was

Figure 1. Recruitment of Patients and Study Completion



interrupted for a pregnancy leave after the initial 89 patients had completed the baseline interview. Recruitment was restarted at the same period the following year, and the remaining 53 patients were recruited.

Of the overall pool of available patients visiting the Heart Failure Clinic during these 2 recruitment windows (n=273), 76 patients (27.8%) did not meet eligibility criteria. Among all eligible patients, 3 patients refused to participate and 12 patients could not be recruited because they left the clinic before being approached. The remaining 182 patients agreed to take part and were scheduled for interview. Among the 182 patients recruited who initially agreed to an interview, 40 did not take part in interviews because they were hospitalized at the time of baseline interview, they died before the baseline interview, they cancelled or forgot their baseline interview and could not be re-scheduled, or they had their baseline interview cancelled by the researcher because of a pregnancy leave. These 40 patients, combined with the 12 patients who left the clinic before being approached, represent 26.4% of all eligible patients who could not take part into the study, compared with 1.5% for those who actually refused the study (n=3).

A total of 142 patients completed the baseline assessment. Table 12 presents the demographic and clinical characteristics of the 55 patients who met the eligibility criteria but did not complete the baseline assessment. These patients were comparable in age, sex, LVEF, and NYHA to the sample of patients who completed the baseline interview.

All 142 patients who completed the baseline assessment were contacted by telephone at follow-up for the psychosocial assessment. Only 2 patients refused the follow-up interview and 4 died before being contacted, a 95.8% completion rate. All 4 patients

Table 12. Demographic and Clinical Characteristics of Patients Who Met the Eligibly Criteria But Did Not Complete the Baseline Interview (n=55) Compared To Those Patients Who Completed the Baseline Interview (n=142)

Demographic Characteristics		Patients who DID NOT complete the baseline interview Number (%) (n=55)	Patients who DID complete the baseline interview Number (%) (n=142)
Age	Mean years (SD)	64.7 (12.5)	65.3 (10.5)
Sex	Male	45 (81.8)	115 (81.0)
	Female	10 (18.2)	27 (19.0)
Left Ventricular Ejection Fraction	≤ 19%	6 (10.9)	22 (15.5)
	20 – 24%	17 (30.9)	38 (26.7)
	25 – 29%	16 (29.1)	40 (28.2)
	30 – 34%	6 (10.9)	25 (17.6)
	35 – 39%	10 (18.2)	17 (12.0)
New York Heart Association class			67 (47.2)
	NYHA class I or II	30 (54.5)	
	NYHA class III or IV	25 (45.5)	75 (52.8)

who died were men, had low left ventricular ejection fractions; most of them were NYHA class III, and interestingly, most of them had lower depression scores at baseline compared to the 136 patients who completed the follow-up interview. The 2 patients who refused the follow-up interview were both women, with LVEF of 30% and 15%, NYHA class of III and II, and baseline depression scores of 111 and 113 respectively. These 136 patients who completed the follow-up interview represent 69% of originaly eligible patients.

The median interval time between baseline and follow-up interview was 3.7 months (mean 3.8, sd: 0.5), with a minimum follow-up time of 2.1 months, and a maximum of 5.6 months.

Demographic and clinical characteristics of the patients who completed both the baseline and follow-up interviews are shown in Tables 13 and 14. The initial data set at baseline was composed predominantly of male patients, who indicated that they were married or had a partner and the mean age of this sample at baseline was 65 years. The small number of women included in this sample (n=27, 19.0%) is notable, but closely reflects the percentage of women attending the clinic and those who were screened for eligibility during the two recruitment windows (screened: n=273; women: n=64, 23.4%; men: n=209, 76.6%). Women were more likely to meet exclusion criteria than men (women: n=27; 42.2%, men: n=49, 23.4%), primarily due to LVEF $\geq$ 40%. Among the women who were excluded, the reasons were LVEF (55.6%), language barrier (25.9%), and concurrent major illness (18.5%). For men, these percentages were 59.2%, 14.3%, and 20.4% respectively, and 6.1% were hospitalized at the time of recruitment or lived too far. Among the 55 eligible patients who were either not recruited (because they left the clinic

Table 13. Demographic Characteristics of the Sample Completing Both Baseline and Follow-UpInterviews (n =136)

Demographic Covariates		Number (%)
Age	Mean years (SD)	65.1 (10.5)
	Range	37 to 85
Sex	Male	111 (81.6)
	Female	25 (18.4)
Marital Status	Single, separated, divorced or widowed	54 (39.7)
	Living with someone or married	82 (60.3)
Living Alone	Yes	31 (22.8)
	No	105 (77.2)
Formal Education	Did not complete high school	42 (30.9)
	Completed high school	94 (69.1)
Years of Schooling	Mean (SD)	11.7 (4.6)
	Range	3 to 28
	< 10 years	45 (33.1)
	≥ 10 years	91 (66.9)
Number of Close Friends	Mean (SD)	6.0 (3.7)
	Range	1 to 20
	Median	5
Number of Close Friends that patient sees or speaks to at least once a Month	Mean (SD)	5.1 (3.2)
	Range	0 to 20
	Median	4

Table 14. Clinical Characteristics of the Sample Completing Both Baseline and Follow-Up Interviews (n =136)

Clinical Covariates		Number (%)
Left Ventricular Ejection Fraction	Range	10 to 39
	≤ 19%	18 (13.2)
	20 – 24%	38 (27.9)
	25 – 29%	39 (28.7)
	30 – 34%	24 (17.7)
	35 – 39%	17 (12.5)
New York Heart Association class	NYHA class I or II	65 (47.8)
	NYHA class III or IV	71 (52.2)
Etiology of Left Ventricular Dysfunction	Ischemic heart disease	101 (74.3)
	Other	35 (25.7)
Modified Charlson Comorbidity Index[a] (excludes cardiac comorbidities)	Mean (SD)	1.6 (1.3)
	Range	0 to 5
	0 comorbidity	34 (25.0)
	1 comorbidities	39 (28.7)
	2 or more comorbidities	63 (46.3)

a The Modified Charlson Comorbidity Index reported in the table and used in the analyses excluded myocardial infarction and CHF categories in the calculation of the index.

before being approached or refused the study) or recruited but not evaluated for baseline interview (because they were hospitalized, died, or had their baseline interview cancelled due to the pregnancy leave), women were not more likely to be excluded (women: n=10, 27.0%; men: n=45, 28.1%).

The LVEF for the study sample ranged from 10% to 39%. Most patients were in NYHA classes II and III, suggesting that they were experiencing slight to marked limitation of physical activity. In these patients, ordinary and less than ordinary physical activity causes fatigue, palpitation, dyspnea or anginal pain. The majority of patients, 74.3%, had CHF secondary to ischemic heart disease. Comorbidity was very common, with 19.1% of the patients with a history of chronic pulmonary disease, 21.3% with peripheral vascular disease, 35.3% with diabetes, and 29.4% with moderate to severe renal disease.

The number of medications that these patients were taking was strikingly high, with a mean number of prescribed medications of 11, at both baseline and follow-up (see Table 15). The patients with the fewest number of medications had 4 prescriptions, and those with the largest number of medications had 23 prescriptions.

In general, patients who took part in the present study had been evaluated by a clinic nurse and a cardiologist at the Heart Failure Clinic an average of 3.5 times in the 6 months proceeding the baseline interview. Similarly, during the 2.1 to 5.6 month follow-up in the study, they had an average of two visits at the clinic (see Table 16). The number of times that patients were in contact with a nurse from the Heart Failure Clinic by means of telephone calls during the study follow-up was also recorded. Fifty percent of the patients received 1 to 2 telephone calls by the clinic nurse, and 20 percent received 3 to 7 telephone

Table 15. Number and Types of Medication Being Taken by Patients Completing Both Baseline and Follow-Up Interviews (n=136)

Medications		Number (%)
AT BASELINE INTERVIEW		
Number of prescribed medications	Mean (SD)	11.4 (3.3)
	Median	11
	Inter-quartile range	9 to 14
Type of medication		
	ACE inhibitors (%)	116 (85.3)
	Antiarrhythmics (%)	42 (30.9)
	Anticoagulant (%)	75 (55.1)
	Antidepressants (%)	21 (15.4)
	Aspirin (%)	82 (60.3)
	B-blockers (%)	61 (44.9)
	Diuretics (%)	133 (97.8)
	Hypoglycemics or insulin (%)	52 (38.2)
AT FOLLOW-UP INTERVIEW		
Number of prescribed medications	Mean (SD)	11.6 (3.3)
	Median	12
	Inter-quartile range	9 to 14
Type of medication		
	ACE inhibitors (%)	112 (82.4)
	Antiarrhythmics (%)	43 (31.6)
	Anticoagulant (%)	78 (57.4)
	Antidepressants (%)	24 (17.6)
	Aspirin (%)	80 (58.8)
	B-blockers (%)	59 (43.4)
	Diuretics (%)	130 (95.6)
	Hypoglycemics or insulin (%)	51 (37.5)

Table 16. Heart Failure Clinic Utilization Before and During the Study Period by Patients Completing Both Baseline and Follow-Up Interviews (n=136)

Visits and Telephone Calls to the Heart Failure Clinic		Number (%)
VISITS BEFORE THE STUDY FOLLOW-UP		
Number of visits to the Heart Failure Clinic before baseline		
Overall visits in previous 2 years[a] (range: 1 to 37)	Mode	1
	Mean (SD)	6.9 (5.6)
	1 or 2 visits	33 (24.3)
	3 to 6 visits	43 (31.6)
	More than 6 visits	60 (44.1)
In the previous 6 months[b] (range: 0 to 11)	Mode	3
	Mean (SD)	3.5 (1.8)
	0 visit	1 (0.7)
	1 to 2 visits	37 (27.2)
	3 to 6 visits	91 (66.9)
	More than 6 visits	7 (5.2)
In the previous 12 months[c] (range: 1 to 19)	Mode	6
	Mean (SD)	5.8 (3.0)
	1 to 2 visits	11 (8.1)
	3 to 6 visits	84 (61.8)
	More than 6 visits	41 (30.1)
VISITS DURING THE STUDY FOLLOW-UP		
Number of visits to the Heart Failure Clinic during the study follow-up (range: 0 to 8)	Mode	1
	Mean (SD)	2 (1.4)
	No visit	9 (6.6)
	1 to 2 visits	95 (69.9)
	3 to 6 visits	31 (22.8)
	More than 6 visits	1 (0.7)
TELEPHONE CALLS DURING THE STUDY FOLLOW-UP		
Number of telephone calls to/from the Heart Failure Clinic during the follow-up		
Made by the nurse (range: 0 to 7)	Mode	1
	Mean (SD)	1.4 (1.4)
	0 call	41 (30.1)
	1 to 2 calls	68 (50.0)
	3 to 7 calls	27 (19.9)
Made by the patient (range: 0 to 7)	Mode	0
	Mean (SD)	.8 (1.2)
	0 call	78 (57.3)
	1 to 2 calls	47 (34.6)
	3 to 7 calls	11 (8.1)

[a] Overall number of visits from entry to the clinic until baseline interview; [b] Number of visits in the previous 6 months before baseline interview; [c] Number of visits in the previous 12 months before baseline interview.

calls. Calls initiated by the patients themselves, either to get information or to report a health problem were also common. Thirty-five percent of the patients made 1 to 2 telephone calls, and 8% made 3 to 7 telephone calls to the nurse, during the study follow-up.

The use of psychiatric services by the patients in the study sample was evaluated through their history of consultations with a psychiatrist or a social worker at the psychosomatic service at the Montreal Heart Institute, both before the study and during the follow-up period (see Table 17). More than half the patients (62.5%) had never consulted a psychiatrist or a social worker before the baseline interview, 10.3% had consulted both, and 27.2% had seen one or the other. During the course of the study, 52.9 % of patients (n=72) had scores on the CDS of greater than 100, indicating moderately severe depression, or had a score of greater than 4 on the 7-point continuum of the suicidal ideation item on the depression scale, at either the baseline or follow-up assessment. These patients were referred to the nurse at the Heart Failure Clinic, who decided whether to contact the patients and offer them a consultation with a psychiatrist. However, a psychiatrist or a social worker saw only 1 in 4 of the referred patients during the study follow-up.

Visits to the emergency room at the MHI or hospitalizations during the course of the study were recorded by reviewing patients' medical charts, in addition to the patients' computerized file from the Heart Failure Clinic. Very few patients visited the emergency room at the Heart Institute (11%) or were hospitalized (10.3%), and in almost all cases of hospitalization the cause was cardiac (see Table 18).

Table 17. Psychosomatic Service Utilization Before and During the Study Period by Patients Completing Both Baseline and Follow-Up Interviews (n =136)

Consultations		Number (%)
CONSULTATIONS BEFORE THE STUDY FOLLOW-UP		
History of consultations at the Psychosomatic Department of the MHI before baseline	Never consulted before baseline	85 (62.5)
	Consulted a Psychiatrist	16 (11.8)
	Consulted a Social Worker	21 (15.4)
	Consulted both	14 (10.3)
CONSULTATIONS DURING THE STUDY FOLLOW-UP		
Overall consultations at the Psychosomatic Department of the MHI during follow-up	Never consulted during follow-up	112 (82.3)
	Consulted a Psychiatrist	17 (12.5)
	Consulted a Social Worker	5 (3.7)
	Consulted both	2 (1.5)
Number of consultations with a Psychiatrist during the follow-up	Range	0 to 4
	Never consulted during follow-up	117 (86.0)
	1 consultation	9 (6.6)
	2 to 4 consultations	10 (7.4)
Number of consultations with a Social Worker during the follow-up	Range	0 to 9
	Never consulted during follow-up	129 (94.9)
	1 to 4 consultations	6 (4.4)
	9 consultations	1 (0.7)

Table 18. Emergency Room (ER) Visits and Hospitalization During the Study Period: Patients Completing Both Baseline and Follow-Up Interviews (n =136)

Variable		Number (%)
EMERGENCY ROOM VISITS		
EVER VISITED ER	No	121 (89.0)
	Yes	15 (11.0)[1]
Total number of days in the ER	Range	0 to 6
	0 day	6
	1 to 2 days	7
	3 or 6 days	2
HOSPITALIZATIONS		
EVER HOSPITALIZED	No	122 (89.7)
	Yes	14 (10.3)[2]
Total number of days hospitalized	Range	0 - 68
	Mean (SD)	11.1 (17)
	0 to 10 days	11
	18 days	2
	68 days	1
EVER HOSPITALIZED FOR CARDIAC REASONS	No	126 (92.6)
	Yes	10 (7.4)

1 One patient visited the ER a second time during the study period.
2 Four patients (2.9%) were hospitalized a second time during the study period.

4.2.2 PSYCHOSOCIAL MEASURES

Table 19 presents data on all psychosocial measures at baseline and at follow-up. At baseline, the mean score on the Cardiac Depression Scale (CDS) was 97.3. Some 63 patients (46.3%; 95% CI: 37.9, 50.6) had a score of 100 or higher, indicating moderately severe depressed mood, as described by Hare and al. (1996).[187] Among the total sample, 25 patients (18.4%) had a score of greater than 125, indicating severe depression. The mean difference between follow-up and baseline depression scores was –2.9 (SD 16.4). However, as the assessment of change in the present study was planned at an intra-individual level, group mean comparisons were not addressed. There were notable variations in the individual scores of depression between baseline and follow-up assessments. One-third of the patients (32%, n=44) had either a decrease or an increase over time of 15 points or more in their depression scores. Despite these variations, several patients with scores on the CDS of greater than 100 at baseline (indicating moderately severe depressed mood), still reported scores above that cutoff at the following assessment. Among the 63 patients who had scores on the CDS of greater than 100 at baseline, 73% (n=46) were still depressed (scores of greater than 100) at follow-up. Among the 73 patients who had scores on the CDS of less than 100 at baseline, 8% (n=6) became depressed (scores of greater than 100) at follow-up.

These results suggest that depression was particularly prevalent at both baseline and follow-up assessments, results that are consistent with previous studies of depression among heart failure patients. Although the prevalence of depression in heart failure patients

Table 19. Psychosocial Measures for Patients Including Both Baseline and Follow-Up Interviews (n=136)

Variables		Baseline (n=136)	Follow-Up (n=136)
CARDIAC DEPRESSION SCALE (CDS)[a]			
Mean score (SD)		**97.3** (28.4)	**94.4** (28.9)
Range		32 to 160	33 to 160
	≤ 100	73 (53.7%)	84 (61.8%)
	101- 125	38 (27.9%)	30 (22.0%)
	> 125	25 (18.4%)	22 (16.2%)
FUNCTIONAL PERFORMANCE INVENTORY SHORT-FORM (FPI-SF)[b]			
Mean score (SD)		**1.7** (0.5)	**1.6** (0.5)
Range		0.44 to 2.78	0.49 to 2.74
REVISED ILLNESS PERCEPTION QUESTIONNAIRE (IPQ -R)[c]			
Subscales, sum score (SD)	*Identity* (1 – 16)[d]	7.8 (2.9)	---
	Timeline (% ≥ 26)	69 (50.7%)	---
	Consequences (6 – 30)[d]	21.8 (4.1)	---
	Personal Control (6 – 30)[d]	22.2 (3.5)	---
	Treatment Control (5 – 25)[d]	18.9 (2.5)	---
	Coherence (5 – 25)[d]	17.7 (3.7)	---
INTERPERSONAL RELATIONSHIPS INVENTORY (IPRI)			
Subscales, sum score (SD)	Social Support (13 – 65)[e]	53.6 (6.5)	---
	Conflict (13 – 65)[e]	30.8 (8.2)	---

a CDS scores > 100 indicate moderately severe depression, and scores > 125 indicate severe depression; b lower FPI scores indicate lower levels of performance; c lower IPQ-R subscale scores indicate low beliefs on the particular dimension; d possible range for the subscales; e lower IPRI scores indicate lower levels of *Support* and *Conflict*.

has varied greatly across studies, due for the most part to the diversity of the populations studied and the methods used to assess depression, heart failure patients are increasingly recognized as a high risk group for depression, with levels of depression that may even exceed those seen in other cardiac patient populations.[30]

The Functional Performance Inventory (FPI-SF) was used to assess patients' functional performance. More than one half of the patients (27%, n=37) had either a decrease or an increase over time of .25 points or more in their functional performance scores. Comparison of the scores on the FPI-SF scale at both assessment times were done with normative data from outpatients with a medical diagnosis of chronic obstructive pulmonary disease, emphysema, or chronic bronchitis.[196 232] Patients in the present study reported similar functional limitations compared with patients who reported severe to very severe perceived disease and activity limitation.

Higher scores on each of the six subscales representing patients' illness perceptions (IPQ-R) on *Identity*, *Timeline*, *Consequences*, *Personal* and *Treatment Control*, and *Coherence* indicate stronger beliefs on the particular dimension, and lower scores on the dimensions represents lower perceptions. Patients in the present study reported lower beliefs about *Personal* and *Treatment Control* compared with COPD patients, and reported lower perceptions of serious *Consequences* of their heart failure [41] compared with patients with RA.[42]

The Interpersonal Relationship Inventory (IPRI) was used to measure the concepts of *Support* and *Conflict*. Most patients reported relatively high perceptions of support, and comparatively low conflict. To compare the scores on the *Support* and *Conflict* subscales in

the present study with that of other studies, scores were computed as means. The results indicated that mean scores on the *Support* and *Conflict* subscales were similar to patients and community residents in other research reports in the literature.[188]

4.3 CROSS-SECTIONAL APPROACH TO ANALYSIS

4.3.1 UNADJUSTED CORRELATIONAL ANALYSES

4.3.1.1 Correlates of Depression

Higher depression at baseline was significantly associated with being younger (r= -.35), having a smaller number of close friends (r=-.39), and being in NYHA class III and IV (r=.17) (see Table 20). Higher depression at baseline was also significantly associated with a greater number of symptoms that the patient identified as linked to heart failure (*Identity*) (r=.40), stronger beliefs about a long and chronic illness duration (*Timeline*) (r=.24), higher perceptions of serious *Consequences* of heart failure (r=.59), weaker beliefs about the effectiveness of *Personal Control* and *Treatment Control* (r=-.25 and r=-.32), and lower perceptions of *Coherence* or understanding of heart failure (r=-.41). These correlation coefficients were all in the predicted direction.

Higher depression at baseline was significantly associated with lower perceptions of the availability of helping behaviors by persons with whom the patient was engaged in relationships (*Support*, r=-.30) and increased perceived discord or stress in relationships (*Conflict*, r=.28).

Table 20. Correlations Among Baseline Illness Perceptions, Social Support, Demographic and Clinical Covariates and Depression and Functional Performance at both Baseline and Follow-Up (n=136)

	Baseline		Follow-Up	
Independent variables [a]	Depression	Functional Performance	Depression	Functional Performance
Demographic Covariates				
Age	-.35**	-.08	-.33**	-.09
Being Male (Male / Female)	-.06	-.11	-.13	-.10*
Marital Status (Married or living with someone / Single, separated, divorced or widowed)	-.05	.07	-.02	.13
Living Alone (Yes / No)	-.01	.05	-.03	.10
Number of Close Friends	-.39**	.26**	-.33**	.27**
Number of Close Friends that patient sees or speaks to at least once a Month	-.40**	.26**	-.34**	.29**
Formal Education (Did not complete high school / Completed high school)	-.01	.09	-.05	.11
Clinical Covariates				
LVEF	-.10	.00	-.15	.01
NYHA (Class I or II / III or IV)	.17*	-.39**	.19*	-.45**
Modified Charlson Comorbidity Index (0 / 1 / 2 or more comorbidities)	-.01	-.25**	.03	-.31**
Etiology (Ischemic / Other)	.04	-.06	.04	-.03
Illness Perceptions Variables				
Identity	.40**	-.32*	.36**	-.33**
Timeline (≥ 26)	.24**	-.16	.21*	-.13
Consequences	.59**	-.24**	.53**	-.19*
Personal Control	-.25**	.25**	-.27**	.26**
Treatment Control	-.32**	.42	-.38**	.40**
Coherence	-.41**	.18*	-.39**	.18*
Social Support Variables				
Support	-.30**	.05	-.36**	.12
Conflict	.28**	-.04	.28**	-.04
Depression and Functional Performance				
Depression (Baseline)	---	-.46**	.84	-.42**
Functional Performance (Baseline)		---	-.44**	.85
Depression (Follow-Up)			---	-.52**
Functional Performance (Follow-Up)				---

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).
a Continuous variables were age, number of close friends, illness perceptions variables (except *Timeline*) and support variables; all other were binary or categorical variables.

4.3.1.2 Correlates of Functional Performance

Higher functional performance at baseline were significantly associated with having a greater number of close friends (r=.26), being in NYHA class I and II (r=-.39), and a smaller number of comorbidities (r=-.25). Higher functional performance at baseline was also significantly associated with a smaller number of symptoms that the patient identified as linked to heart failure (*Identity*) (r= -.32), weaker beliefs about a long and chronic illness duration (*Timeline*) (r=-.16), lower perceptions of serious *Consequences* of heart failure (r=-.24), stronger beliefs about the effectiveness of *Personal Control* and *Treatment Control* (r=.25 and r=.42), and higher perceptions of *Coherence* or understanding of heart failure (r=.18). These correlation coefficients were all in the predicted direction. Functional performance at baseline was not significantly correlated with *Support* or *Conflict*.

4.3.1.3 Correlations Among Demographic, Clinical and Psychosocial Variables

Correlation coefficients among the demographic and clinical covariates, and among these covariates and illness perception variables are presented in Table 21.

Male patients were more likely to have had a diagnosis of heart failure secondary to ischemic heart disease; such a diagnosis was also related to older age. Younger patients were more likely to report higher perceptions of serious *Consequences* of heart failure (r=-.43), but at the same time they were more likely to report a greater number of symptoms that they believed to be linked to heart failure (r=-.25). Patients who reported being married or living with someone were more likely to report higher perceptions of *Support* (r=.21).

Table 21. Correlation Matrix Among Baseline Demographic, Clinical Covariates and Baseline Psychosocial Variables (n=136)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	---	-.04	.00	-.03	-.03	.02	.03	.05	-.24**	-.25**	-.10	-.43**	-.10	-.12	.07	.08	-.13
2. Being Male		---	-.08	-.01	-.14	.13	.04	-.08	.24**	.02	.01	-.04	-.08	-.04	.08	.08	.05
3. Marital Status			---	.67**	.04	-.03	-.09	.13	-.03	.06	.10	.06	-.03	.02	.04	.21*	-.10
4. Living alone				---	-.10	.00	-.10	.06	.08	.04	.03	.02	-.07	-.04	-.09	.10	.00
5. Formal Education (Did not / Completed high school)					---	.01	-.07	.09	-.04	-.04	.17*	.18*	.25**	.28**	.15	-.04	.08
6. LVEF						---	.00	-.08	-.13	.10	-.11	-.02	.25**	.11	.02	.00	.10
7. NYHA (I or II / III or IV)							---	.29**	.03	.17	.01	.18*	-.18*	-.17*	.00	-.07	.02
8. Charlson Comorbidity (0 / 1 / 2 or more)								---	-.05	.07	.16	.02	-.10	-.15	.10	.06	-.15
9. Etiology (Ischemic / Other)									---	.09	-.03	.13	.06	.11	-.05	.00	-.03
10.Illness Perceptions: Identity										---	.23**	.41**	-.01	-.13	-.08	.13	.12
11.Illness Perceptions: Timeline (≥ 26)											---	.35**	-.09	-.18*	.14	-.02	.03
12.Illness Perceptions: Consequences												---	-.07	-.08	-.16	-.10	.29**
13.Illness Perceptions: Personal Control													---	.58**	.32**	.11	-.02
14.Illness Perceptions: Treatment Control														---	.29**	.16	.00
15.Illness Perceptions: Coherence															---	.24**	-.19*
16.Social Support: Support																---	-.28**
17.Social Support: Conflict																	---

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

a Continuous variables were age, number of close friends, illness perceptions variables (except *Timeline*) and support variables; all other were binary or categorical variables.

Patients who reported having completed high school were more likely to report stronger beliefs about a long and chronic illness duration (r=.17), higher perceptions of serious *Consequences* of heart failure (r=.18), but at the same time, they had stronger beliefs about *Personal Control* (r=.25) and the effectiveness of *Treatment Control* (r=.28). Patients in NYHA class III and IV, those more physically limited by heart failure symptoms, had a greater number of comorbid conditions (r=.29), higher perceptions of serious *Consequences* of heart failure (r=.18), and also weaker beliefs about *Personal Control* (r=-.18) and the effectiveness of *Treatment Control* (r=-.17). Patients with higher perceptions of serious *Consequences* of heart failure were likely to report a greater number of symptoms that the patients identified as linked to heart failure (r=.41), and stronger beliefs about a long illness duration (r=.35), and also were more likely to report higher conflict in relationships (r=.29). Patients who reported stronger beliefs about a long illness duration were also more likely to report more symptoms that the patients identified as linked with heart failure (r=.23). Patients with stronger beliefs about *Personal Control* also reported stronger beliefs about the effectiveness of *Treatment Control* (r=.58) and better *Coherence* or understanding of heart failure (r=.32). Patients with stronger beliefs about the effectiveness of *Treatment Control* also had a better understanding of heart failure (r=.29). Patients with higher perceptions of the availability of helping behaviors by persons with whom they were engaged in relationships (better *Support*) were more likely to report a better understanding of heart failure (r=.24) and less *Conflict* in relationships (r=-.28).

4.3.2 ADJUSTED CORRELATIONAL ANALYSES

Partial correlation coefficients were used to describe the relationships between baseline illness perceptions and both depression and functional performance at baseline, and between baseline social support and both depression and functional performance at baseline, adjusting for the relevant demographic and clinical covariates. Results are presented in Table 22.

Adjustment for demographic and clinical covariates was most influential for the correlation coefficients between depression at baseline and perceptions of serious *Consequences* of heart failure, and beliefs about *Personal* and *Treatment Control*. For functional performance at baseline, adjustment for demographic and clinical covariates was most influencial for perceptions of serious *Consequences* of heart failure, and perceptions of *Coherence*.

In summary, results of the cross-sectional analyses showed that all illness perception and social support variables were significantly associated with depression at baseline, with or without adjustment for demographic and clinical covariates. Similarly, most illness perception variables were significantly associated with functional performance at baseline, and these associations remained significant even after adjusting for the effect of demographic and clinical covariates. Beliefs about a long and chronic illness duration (*Timeline*) and social support variables (*Support* and *Conflict*) were not associated with functional performance at baseline.

Table 22. Partial Correlation Coefficients Among Illness Perceptions and Social Support at Baseline and Both Depression and Functional Performance at Baseline and Follow-Up (n=136)

Independent variables	Dependent Variables at Baseline				Dependent Variables at Follow-Up			
	Depression		**Functional Performance**		**Depression**		**Functional Performance**	
	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]
ILLNESS PERCEPTIONS								
Identity	.40**	.37**	-.32*	-.35**	.36**	.33**	-.33**	-.36**
Timeline	.24**	.23*	-.16	-.16	.21*	.21*	-.13	-.12
Consequences	.59**	.54**	-.24**	-.36**	.53**	.47**	-.19*	-.31**
Personal Control	-.25**	-.30**	.25**	.21*	-.27**	-.32**	.26**	.21*
Treatment Control	-.32**	-.42**	.42**	.40**	-.38**	-.48**	.40**	.38**
Coherence	-.41**	-.42**	.18*	.24*	-.39**	-.40**	.18*	.26**
SOCIAL SUPPORT								
Support	-.30**	-.29**	.05	.09	-.36**	-.36**	.12	.16
Conflict	.28**	.27**	-.04	-.10	.28**	.28**	-.04	-.12

a Adjusted for age, sex, living alone, formal education, LVEF, and Modified Charlson Comoridity Index.
** Correlation coefficients are significant at the 0.01 level (2-tailed). * Correlation coefficients are significant at the 0.05 level (2-tailed).

4.4 LONGITUDINAL APPROACH TO ANALYSIS

4.4.1 ASSESSMENT OF CHANGE IN DEPRESSION AND FUNCTIONAL PERFORMANCE

DELTA CHANGE SCORES and RESIDUAL CHANGE SCORES for both depression and functional performance as dependent variables were computed in order to provide an assessment of intra-individual changes over the follow-up period (see Table 23). DELTA CHANGE SCORES were calculated as the difference between the follow-up and the baseline scores. An inspection of the distribution of these scores revealed remarkable fluctuations over time for both dependent variables. DELTA CHANGE SCORES for depression ranged from a low of –73 (indicating an improvement in depression symptoms over time) to a high of 38 (indicating a worsening in depression symptoms over time). For functional performance, they ranged from a low of –1.21 (indicating a worsening in functioning over time) to a high of 0.70 (indicating improved functioning over time).

RESIDUAL CHANGE SCORES were obtained by subtracting the observed score at follow-up from the score predicted linearly by the initial score. For both depression and functional performance, when the portion predicted linearly from the initial score was removed from the score at follow-up, the RESIDUAL CHANGE SCORES similarly showed notable variations over time. RESIDUAL CHANGE SCORES, as estimates of the true difference scores, were centered around zero, as these scores represent the true residuals, calculated as the difference between the follow-up scores and those predicted linearly from the baseline scores.

Table 23. DELTA CHANGE SCORES and RESIDUAL CHANGE SCORES for Depression and Functional Performance (n=136)

Change Scores	DEPRESSION	FUNCTIONAL PERFORMANCE
DELTA CHANGE (Time 2 – Time 1)		
Mean change (SD)	-2.9 (16.4)	0.0 (0.3)
Minimum change	-73.0	-1.2
Maximum change	38.0	0.7
Percentile 25	-12.0	-0.2
Percentile 50	-1.0	-0.0
Percentile 75	7.0	0.1
RESIDUAL CHANGE ($Y_2 - E[Y_2|Y_1]$)		
Mean of residuals (SD)	0 (15.9)	0 (0.3)
Minimum change	-63.2	-1.2
Maximum change	44.0	0.7
Percentile 25	-9.5	-0.1
Percentile 50	-.0	0.0
Percentile 75	9.6	0.2

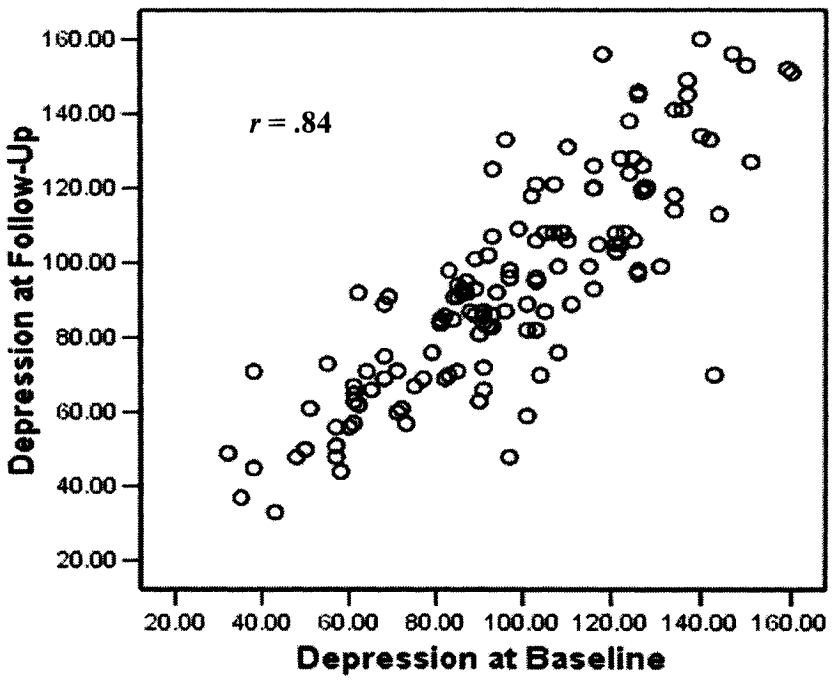
Although notable variations in the scores of depression and functional performance were observed over time for half the patients in this sample, an equal number of patients showed fewer variations over the two assessment times. This stability in the scores of both depression and functional performance over time is reflected in the high correlation coefficients between baseline and follow-up depression (r=.84), and between baseline and follow-up functional performance (r=.85). These correlations are portrayed in scatterplots of depression at baseline and depression at follow-up in Figure 2a, and functional performance at baseline and functional performance at follow-up in Figure 2b.

This stability has implications for the analyses. In the longitudinal approach, the baseline psychosocial variables (illness perceptions and social support variables) were defined as predictor variables for the follow-up variables (depression and functional performance), taking into account baseline scores of the dependent variables. However, because the majority of patients did not show important variations in both dependent variables over the follow-up period, adjusting for the baseline values of the dependent variables removes much variance in the follow-up scores, and leaving less to be explained by the independent variables. The relative stability of depression and functional performance over the follow-up period therefore limits the benefits of the longitudinal analyses.

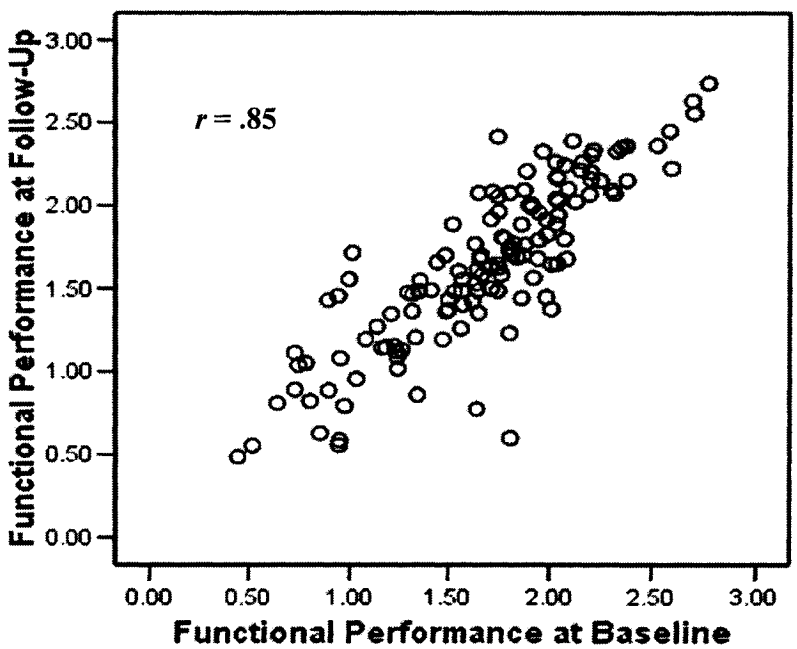
In the following sections, multiple linear regressions were performed to evaluate the associations between each of the six illness perception variables and two social support variables with depression and functional performance, using three different approaches

Figure 2. Correlations Between Depression and Functional Performance at Baseline and Follow-up (n=136)

a.



b.



to the dependent variables: 1) DELTA CHANGE SCORES, 2) RESIDUAL CHANGE SCORES, and 3) ADJUSTED FOLLOW-UP SCORES. As described in the statistical plan (see section 3.7.2.2 in Chapter 3), the last of these approaches, using the ADJUSTED FOLLOW-UP SCORES (the follow-up scores adjusting for the baseline scores), was chosen as the preferred alternative for all analyses, because this approach did not require an additional step in the calculation of the change score, and for reasons of simplicity and comparability with other longitudinal studies of depression.

Two summary tables for results involving these three approaches are initially presented (Tables 24 and 25). Results of the multiple linear regressions performed cross-sectionally with the BASELINE SCORES only, are also presented in the first summary table to compare the results obtained cross-sectionally with those obtained longitudinally. Next, Table 26 provides additional details such as the R^2 difference, p values, estimates of the unstandardized regression coefficients beta, and standard error for beta, for the ADJUSTED FOLLOW-UP SCORES. The detailed results of regression analyses for the BASELINE SCORES, the DELTA CHANGE SCORES, and the RESIDUAL CHANGE SCORES as dependent variables are presented in Appendices J, K and L.

The results of the analyses assessing the potential moderating effect of social support on the relationship between illness perceptions and depression ADJUSTED FOLLOW-UP SCORES are presented in Tables 27a and 27b, and between illness perceptions and functional performance ADJUSTED FOLLOW-UP SCORES in Tables 28a and 28b. Results of the analyses assessing the moderating effect of social support for the other approaches to the dependent variables appear in Appendices M-1 to M-4, N-1 to N-4, and O-1 to O-4. Lastly,

the longitudinal associations between baseline depression and functional performance at follow-up, and the associations between baseline functional performance and depression at follow-up are described.

4.4.2 MAIN EFFECT OF ILLNESS PERCEPTIONS

The first four columns of the summary Table 24 present results of the multiple linear regressions using the BASELINE SCORES as the dependent variable for each of the six illness perception variables and the two social support variables. The next four columns present results for the DELTA CHANGE SCORES for both depression and functional performance. The last four columns present results for RESIDUAL CHANGE SCORES, and Table 25 shows results for ADJUSTED FOLLOW-UP SCORES.

The demographic and clinical covariates explained 15% and 17% of the variability in depression at baseline and at follow-up. These covariates similarly explained 12% and 15% of the variability in functional performance at baseline and follow-up respectively (see Table 24 and 25). Results showed that all illness perception variables and social support variables contributed significantly to the variance in depression at both baseline (see Table 24) and follow-up (see Table 25), beyond that afforded by demographic and clinical covariates. Similarly for functional performance, most illness perception variables contributed significantly to its variance at both baseline and follow-up, after adjusting for demographic and clinical covariates. For example, (see Table 26) higher perceptions of serious *Consequences* of heart failure at baseline explained an additional 11% in the variance in functional performance at baseline, after controlling for demographic

Table 24. Additional Variance in Depression and Functional Performance's BASELINE SCORES, DELTA CHANGE SCORES, and RESIDUAL CHANGE SCORES Explained by Illness Perceptions and Social Support over and above that Explained by Demographic and Clinical Covariates (n=136)

Model	BASELINE SCORES				DELTA CHANGE SCORES				RESIDUAL CHANGE SCORES			
	No adjustment		Adjusted for Demo/Clin Cov[a]		No adjustment		Adjusted for Demo/Clin Cov[a]		No adjustment		Adjusted for Demo/Clin Cov[a]	
	R^2 *change*	*p* value	R^2 *change*	*p* value	R^2 *change*	*p* value	R^2 *change*	*p* value	R^2 *change*	*p* value	R^2 *change*	*p* value
Dependent variable: **DEPRESSION**												
Independent variables:												
Covariate Adjustment	---	---	**.15**	.03*	---	---	**.05**	.80	---	---	**.07**	.50
and Identity	.16	<.01**	.12	<.01**	.01	.41	.01	.43	.00	.68	.00	.82
and Timeline	.06	.01**	.05	.01**	.00	.62	.00	.63	.00	.81	.00	.87
and Consequences	.35	<.01**	.25	<.01**	.01	.27	.01	.22	.00	.48	.00	.78
and Personal Control	.06	<.01**	.08	<.01**	.00	.64	.00	.74	.01	.21	.01	.22
and Treatment Control	.10	<.01**	.15	<.01**	.01	.19	.01	.30	.04	.02*	.04	**.02***
and Coherence	.17	<.01**	.15	<.01**	.00	.71	.00	.67	.01	.37	.00	.44
and Support	.09	<.01**	.07	<.01**	.01	.18	.01	.18	.04	.02*	.04	**.02***
and Conflict	.08	<.01**	.06	<.01**	.00	.92	.00	.79	.01	.33	.01	.29
Dependent variable: **FUNCTIONAL PERFORMANCE**												
Independent variables:												
Covariate Adjustment	---	---	**.12**	.08	---	---	**.02**	.99	---	---	**.04**	.84
and Identity	.10	<.01**	.10	<.01**	.00	.72	.00	.77	.01	.19	.01	.21
and Timeline	.03	.07	.02	.08	.00	.54	.00	.48	.00	.87	.00	.75
and Consequences	.06	<.01**	.11	<.01**	.01	.33	.01	.32	.00	.77	.00	.96
and Personal Control	.06	<.01**	.04	.02*	.00	.79	.01	.93	.01	.30	.00	.51
and Treatment Control	.18	<.01**	.14	<.01**	.00	.85	.00	.65	.01	.30	.00	.54
and Coherence	.03	.03*	.05	.01**	.00	.96	.00	.81	.00	.56	.01	.36
and Support	.00	.53	.01	.33	.02	.15	.02	.15	.02	.10	.02	.08
and Conflict	.00	.66	.01	.27	.00	.91	.00	.70	.00	.82	.00	.50

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical variables included age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables) and Modified Charlson Comorbidity Index (2 indicator variables).

Table 25. Additional Variance in Depression and Functional Performance ADJUSTED FOLLOW-UP SCORES Explained by Illness Perceptions and Social Support over and above that Explained by the Baseline Measure, Demographic and Clinical Covariates (n=136)

MODEL	No Adjustment		Adjusted for Baseline Measure		Adjusted for Demographic and Clinical Covariates[a]		Adjusted for Baseline, Demographic and Clinical Covariates[a]	
	R^2 change	*p* value	*R^2 change*	*p* value	*R^2 change*	*p* value	*R^2 change*	*p* value
Dependent variable: **DEPRESSION** (Follow-Up)								
Independent variables:								
Covariate Adjustment	---	---	**.70**	<.01**	**.17**	.01*	**.72**	<.01**
and Identity	.13	<.01**	.00	.65	.09	<.01**	.00	.60
and Timeline	.05	.01**	.00	.81	.04	.02*	.00	.74
and Consequences	.28	<.01**	.00	.38	.18	<.01**	.00	.44
and Personal Control	.07	<.01**	.00	.20	.09	<.01**	.01	.13
and Treatment Control	.15	<.01**	.01	.01**	.19	<.01**	**.02**	**<.01****
and Coherence	.15	<.01**	.00	.33	.13	<.01**	.00	.24
and Support	.13	<.01**	.01	.01**	.11	<.01**	**.02**	**.01****
and Conflict	.08	<.01**	.00	.32	.07	<.01**	.00	.20
Dependent variable: **FUNCTIONAL PERFORMANCE** (Follow-Up)								
Independent variables:								
Covariate Adjustment	---	---	**.72**	<.01**	**.15**	.02*	**.74**	<.01**
and Identity	.11	<.01**	.00	.17	.11	<.01**	.01	.11
and Timeline	.02	.14	.00	.87	.01	.19	.00	.84
and Consequences	.04	.02*	.00	.76	.08	<.01**	.00	.83
and Personal Control	.07	<.01**	.00	.29	.04	.02*	.00	.41
and Treatment Control	.16	<.01**	.00	.25	.12	<.01**	.00	.32
and Coherence	.03	.03*	.00	.55	.06	<.01**	.00	.26
and Support	.01	.16	.01	.10	.02	.07	.01	.07
and Conflict	.00	.62	.00	.82	.01	.18	.00	.45

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates included age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables) and Modified Charlson Comorbidity Index (2 indicator variables).

Table 26. Additional Variance in Depression and Functional Performance's ADJUSTED FOLLOW-UP SCORES Explained by Illness Perceptions and Social Support over and above that Explained by Baseline Measure, Demographic and Clinical Covariates (n=136)

Variables	Model	Total Model R^2	R^2 change	p value (F change)	Parameters for the Baseline Measure[a]		Parameters for the Independent variables	
					B Coefficient	*SE* of *B*	*B* Coefficient	*SE* of *B*
Dependent:	**DEPRESSION** (Follow-Up)							
Independent:	Depression [a]	**.70**	---	<.01**	.85	.05	---	---
	Demographic and clinical covariates [b]	.72	.02	.46	.81	.05	---	---
	and Identity	.72	.00	.60	.80	.06	.29	.54
	and Timeline	.72	.00	.74	.81	.05	1.00	2.95
	and Consequences	.72	.00	.44	.79	.06	.35	.45
	and Personal Control	.73	.01	.13	.79	.06	-.68	.45
	and Treatment Control	**.74**	**.02**	**<.01****	.74	.06	-1.89	.64
	and Coherence	.72	.00	.24	.78	.06	-.51	.43
	and Support	**.74**	**.02**	**.01***	.77	.05	-.58	.22
	and Conflict	.72	.00	.20	.79	.05	.24	.18
Dependent:	**FUNCTIONAL PERFORMANCE** (Follow-Up)							
Independent:	Functional Performance [a]	**.72**	----	<.01**	.86	.05	---	---
	Demographic and clinical covariates [b]	.74	.01	.80	.83	.05	---	---
	and Identity	.74	.01	.11	.80	.05	-.01	.01
	and Timeline	.74	.00	.84	.83	.05	.01	.05
	and Consequences	.74	.00	.83	.82	.05	.00	.01
	and Personal Control	.74	.00	.41	.82	.05	.01	.01
	and Treatment Control	.74	.00	.32	.81	.05	.01	.01
	and Coherence	.74	.00	.26	.81	.05	.01	.01
	and Support	.74	.01	.07	.82	.05	.01	.00
	and Conflict	.74	.00	.45	.82	.05	.00	.00

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Depression or Functional Performance at baseline were forced into the regression models as an initial step; b: The demographic and clinical covariates in all regression models were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

and clinical covariates. However, neither *Timeline*, *Support* nor *Conflict* explained a significant percentage of variance in functional performance at either baseline or follow-up, when the effects of demographic and clinical covariates were taken into account.

The demographic and clinical covariates contributed very little to the variability in DELTA CHANGE SCORES and RESIDUAL CHANGE SCORES for both depression and functional performance (see Table 24). They explained 5% and 7% of the variability in depression, and 2% and 4% of the variability in functional performance. Moreover, none of the six illness perception variables and none of the two social support variables contributed significantly to the variance in DELTA CHANGE SCORES for either depression or functional performance, with or without adjustment for demographic or clinical covariates (see Appendix K). However, when the RESIDUAL CHANGE SCORE was used as the dependent variable, one illness perception variable (*Treatment Control*) and one social support variable (*Support*) remained significant in explaining depression with or without adjustment for demographic and clinical covariates (see Table 24 and Appendix L for the regression parameters for RESIDUAL CHANGE SCORES).

Results of the multiple linear regressions that involved the RESIDUAL CHANGE SCORES were similar to those obtained with the ADJUSTED FOLLOW-UP SCORES, for both dependent depression and functional performance. Results of the regressions involving the ADJUSTED FOLLOW-UP SCORES are presented in Table 26. In these regressions, the baseline score of the variable (the baseline score of depression or the baseline score of functional performance), was forced in the regressions as an initial step, followed by the demographic and clinical covariates. The baseline scores explained 70% and 72% of the variability (R^2)

in depression and functional performance at follow-up respectively. The addition of demographic and clinical covariate to these models did not explain further variability. The effectiveness of *Treatment Control* was the only illness perception variable that contributed significantly to the variance in follow-up depression scores, when depression at baseline, demographic and clinical covariates were taken into account. *Treatment Control* explained an additional 2% of variance in follow-up depression scores, (R^2 for the overall model: 74%)(see Table 26). As beliefs about the effectiveness of *Treatment Control* were higher by one unit, depression at follow-up decreased by -1.89 (95% CI: -3.16, -.63).

Similarly, *Support* at baseline contributed an additional 2% of variance in depression follow-up scores, when baseline depression and demographic and clinical covariates were taken into account. In contrast, *Conflict* at baseline was not significant once the effect of baseline depression and demographic and clinical covariates were already controlled for.

For functional performance at follow-up, none of the illness perception variables contributed significantly to its variance, given that functional performance at baseline, the demographic and clinical covariates were already accounted for. Baseline functional performance accounted for as much as 72% in the variability in follow-up scores.

Partial coefficients of correlation were used to further describe the relationships between baseline illness perceptions and both depression and functional performance at follow-up, adjusting for the effect of relevant demographic and clinical covariates. Higher *Identity* perceptions at baseline (partial r= .33), stronger beliefs about a long and chronic illness duration or *Timeline* (partial r=.21), higher perceptions of serious *Consequences* of

heart failure (partial r=.47), but weaker beliefs about *Personal* and *Treatment Control* (partial r=-.32, and r=-.48, respectively), and lower perceptions of *Coherence* or understanding of heart failure at baseline (partial r=-.40), were all significantly associated with higher depression at follow-up.

Similarly for functional performance at follow-up, partial coefficients of correlation showed that lower *Identity* perceptions at baseline (partial r= -.36), lower perceptions of serious *Consequences* of heart failure (partial r=-.31), but stronger beliefs about *Personal* and *Treatment Control* (partial r=.21, and r=.38, respectively), and higher perceptions of *Coherence* or understanding of heart failure at baseline (partial r=.26), were significantly associated with higher levels of functional performance at follow-up. Patients beliefs about a long and chronic illness duration at baseline (*Timeline*) was the only illness perception variable not significantly associated with functional performance at follow-up (partial r=-.12).

In summary, results of the analyses involving the main effects of illness perceptions on depression and functional performance at follow-up showed that patients beliefs about the effectiveness of *Treatment Control* at baseline was the only illness perception variable that significantly contributed to the variance in depression at follow-up. Therefore, only hypotheses Ie about the main effect of *Treatment Control* on depression at follow-up was supported. Hypotheses Ia, b, c, d, and f, concerning a main effect for the *Identity*, *Timeline*, *Consequences*, *Personal Control* and *Coherence* dimensions of illness perceptions on depression, did not receive support. Similarly, hypotheses IIa through IIf, involving a main effect for each illness perception variable on functional performance at follow-up, did not

receive support. However, results showed that support at baseline had a main effect on depression at follow-up. Patients who reported higher perceptions in the availability of helping behaviors at baseline, also reported lower levels of depression at follow-up. In contrast, conflict did not appear to have a main effect on either depression or functional performance at follow-up.

4.4.3 MODERATING EFFECT OF SOCIAL SUPPORT

The moderating effect of support and conflict on the relationships between illness perceptions at baseline and depression at follow-up, and between illness perceptions at baseline and functional performance at follow-up, was evaluated using product terms involving each of the *Support* and *Conflict* domains with each of the illness perception variables. For example, it was hypothesized that the magnitude of the relationship between illness perceptions and depression at follow-up varies as a function of the patient's perceived availability of *Support*, even after controlling for demographic and clinical covariates, and the baseline measure of depression. Tables 27a and 27b present the results of the multiple linear regressions involving depression's ADJUSTED FOLLOW-UP SCORES, and Tables 28a and 28b present results involving functional performance's ADJUSTED FOLLOW-UP SCORES. In these Tables, the significance of the product terms were systematically evaluated in the following order: first, after controlling for main effects only (each illness perception variable and the social support variable); second, after controlling for depression or functional performance at baseline; and third, after controlling for the baseline scores, and demographic and clinical covariates.

Table 27a. Moderating Effect of Support and Conflict on the Relationship Between Illness Perceptions (Identity, Timeline and Consequences) and Depression at Follow-Up (n=136)

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *for the interaction term*	*p* value *for the interaction term*	R^2	R^2 change *for the interaction term*	*p* value *for the interaction term*
Dependent: **DEPRESSION** (Follow-Up)						
Independent:						
Identity, Soc. Support	.30	---	---	.18	---	---
Identity, Soc. Support, Identity * Soc. Support	.31	.01	.11	.20	.02	**.07**
Identity, Soc. Support, Depression,[a] Identity * Soc. Support	.72	.00	.30	.70	.00	.99
Identity, Soc. Support, Depression,[a] Demo/Clinical,[b] Identity * Soc. Support	.74	.00	.39	.72	.00	**.94**
Dependent: **DEPRESSION** (Follow-Up)						
Independent:						
Timeline, Soc. Support	.18	---	---	.12	---	---
Timeline, Soc. Support, Timeline * Soc. Support	.18	.00	.49	.13	.01	.25
Timeline, Soc. Support, Depression,[a] Timeline * Soc. Support	.71	.00	.28	.70	.00	.39
Timeline, Soc. Support, Depression,[a] Demo/Clinical,[b] Timeline * Soc. Support	.74	.00	.57	.73	.00	.21
Dependent: **DEPRESSION** (Follow-Up)						
Independent:						
Consequences, Soc. Support	.38	---	---	.29	---	---
Consequences, Soc. Support, Consequences * Soc. Support	.38	.00	.88	.29	.00	.74
Consequences, Soc. Support, Depression,[a] Consequences * Soc. Support	.72	.00	.33	.70	.00	.60
Consequences, Soc. Support, Depression,[a] Demo/Clin.,[b] Consequences * Soc. Support	.74	.00	.50	.73	.00	.90

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Depression at baseline; b: Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

Table 27b. Moderating Effect of Support and Conflict on the Relationship Between Illness Perceptions (Personal Control, Treatment Control and Coherence) and Depression at Follow-Up (n=136)

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **DEPRESSION** (Follow-Up)						
Independent:						
Personal Control, Soc. Support	.18	---	---	.14	---	---
Personal Control, Soc. Support, Personal Cont.* Soc. Support	.19	.00	.78	.14	.00	.99
Personal Control, Soc. Support, Depression,[a] Personal Cont.* Soc. Support	.72	.01	.04*	.70	.00	.89
Personal Control, Soc. Support, Depression,[a] Demo/Clin.,[b] Personal Cont.* Soc. Support	.75	.01	**.05***	.73	.00	.73
Dependent: **DEPRESSION** (Follow-Up)						
Independent:						
Treatment Control, Soc. Support	.24	---	---	.23	---	---
Treatment Control, Soc. Support, Treatment Cont.* Soc. Support	.24	.00	.80	.24	.02	.09
Treatment Control, Soc. Support, Depression,[a] Treatment Cont.* Soc. Support	.73	.00	.19	.72	.00	.29
Treatment Control, Soc. Support, Depression,[a] Demo/Clin.,[b] Treatm. Cont.* Soc. Support	.75	.00	.20	.75	.00	.28
Dependent: **DEPRESSION** (Follow-Up)						
Independent:						
Coherence, Soc. Support	.23	---	---	.19	---	---
Coherence, Soc. Support, Coherence * Soc. Support	.23	.01	.32	.20	.00	.44
Coherence, Soc. Support, Depression,[a] Coherence * Soc. Support	.71	.00	.88	.71	.00	.17
Coherence, Soc. Support, Depression,[a] Demo/Clin.,[b] Coherence * Soc. Support	.74	.00	.91	.73	.01	.11

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed). a Depression at baseline; b: Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

Results of the regressions without adjustment for either depression at baseline or demographic and clinical covariates indicated that neither *Support* nor *Conflict* modified the relationships between illness perceptions and depression at follow-up, except for one interaction, that involved *Conflict* and *Identity* (Table 27a). However, when this interaction was tested in a model that accounted for depression at baseline, and demographic and clinical covariates, this interaction did not remain significant.

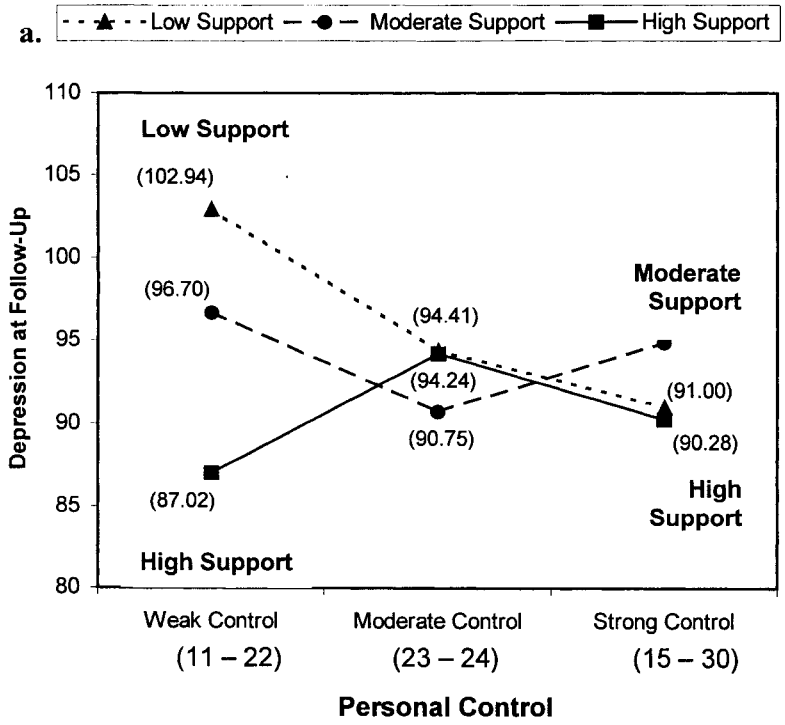
4.4.3.1 Moderating Effects of Support on Personal Control and Depression

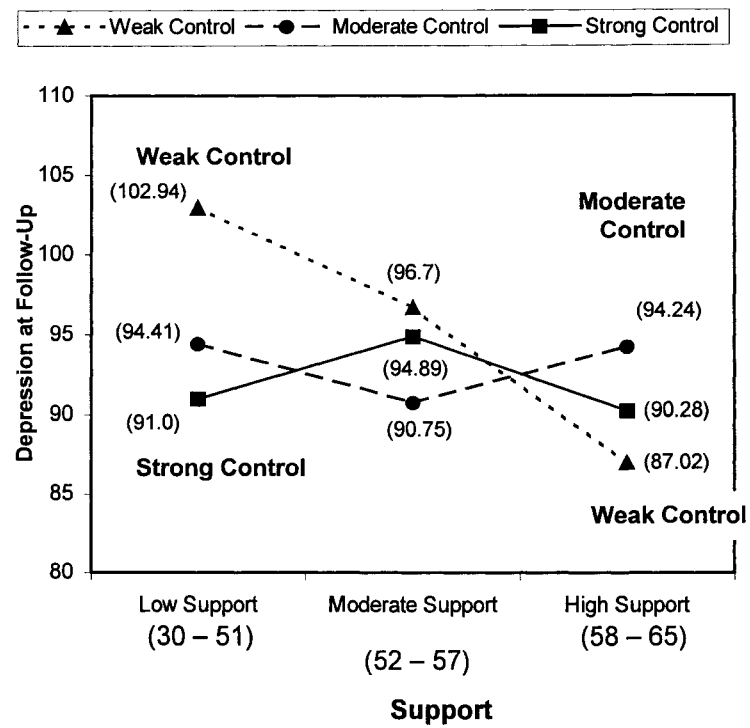
The interaction involving patients' beliefs about *Personal Control* and *Support* was the only significant interaction term, when depression at baseline, demographic and clinical covariates were accounted for. This result suggests that the relationship between patients' beliefs about *Personal Control* and depression at follow-up varies as a function of patients' perceived availability of *Support*.

This relationship is illustrated in Figures 3a, and 3b. In these figures, presented as pairs of graphs, mean depression scores at follow-up (adjusted for depression at baseline, demographic and clinical covariates) are plotted against each of the two independent variables (the illness perception variable and the support variable as tertiles) used alternatively on the X-axis.

Figure 3a illustrates the moderating effect of *Support* on the relationship between beliefs about *Personal Control* at baseline and depression at follow-up. This Figure suggests that in patients who reported lower *Support* at baseline (identified by the dotted

Figure 3. Graphical Display of the Moderating Effect of Support on the Relationship Between Personal Control and Depression at Follow-Up (means adjusted for the demo/clinical covariates and baseline depression)





PARTIAL CORRELATION COEFFICIENTS:

Among low support (n=49): $r_{\text{Depression and Pers.Control/cov}} = -.36^{*}$ (p=.03)

Among moderate support (n=47): $r_{\text{Depression and Pers.Control /cov}} = .01$

Among high support (n=40): $r_{\text{Depression and Pers.Control /cov}} = .03$

PARTIAL CORRELATION COEFFICIENTS:

Among weak control (n=59): $r_{\text{Depression and Support /cov}} = -.37^{**}$ (p=.01)

Among moderate control (n=52): $r_{\text{Depression and Support /cov}} = -.28$

Among strong control (n=25): $r_{\text{Depression and Support /cov}} = .27$

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

line), beliefs about *Personal Control* was more strongly related to depressive symptoms at follow-up (partial correlation coefficient r = -.36; p=.03), compared with patients with moderate or higher levels of *Support*, after controlling for baseline depression, demographic and clinical covariates. In contrast, in patients with moderate or higher *Support* at baseline (identified by the broken line and the solid line), this relationship was non-existent.

Figure 3b offers another perspective on these relationships, using the levels of *Support* on the X-axis. Results suggest that in patients who reported weaker beliefs about *Personal Control* at baseline (identified by the dotted line), support was more strongly related to depressive symptoms at follow-up (partial correlation coefficient r = -.37; p=.01), compared with patients with moderate or stronger beliefs about *Personal Control*, after adjusting for baseline depression, demographic and clinical covariates. In contrast, in patients with moderate or stronger beliefs about *Personal Control* (identified by the broken line and the solid line), this relationship was non significant (partial r = -.28, p=.08; r = .27, p=.36).

These results provide support for the buffering or vulnerability model of social support, as previously described. According to this model, social support will have a greater influence on depression in situations where patients experience more severe illness, or stress, or in the context of the present study, among patients who reported weaker beliefs about *Personal Control*. As shown in Figure 3b, in patients who reported weaker beliefs about *Personal Control*, the presence of support acted as a "protective factor" against depression, and its absence, a "vulnerability factor" for depression. In fact, the vulnerability

or protective effect of *Support* was most manifest in patients with weaker to moderate beliefs about *Personal Control*, identified by the dotted line. For these patients with weaker beliefs about *Personal Control*, support was most important. In contrast, the vulnerability or protective effect of *Support* was not present in patients who reported moderate or stronger beliefs about *Personal Control*.

What made patients with weaker beliefs about *Personal Control* more likely to benefit from *Support* in relation to depression? These patients may in fact perceive a greater stress associated with their illness, because they may believe they have no or only moderate control over their symptoms, and that whatever they do, they will have frequent exacerbations of their illness. The demographic and clinical characteristics of patients with different levels of *Personal Control* were contrasted with those of patients with different levels of *Support*, but no major differences were apparent. However, patients reporting higher beliefs about *Personal Control* were more educated, compared to patients with lower levels of control, but this did not differ according to their level of *Support*.

4.4.3.2 Moderating Effects of Support on Personal Control and Functional Performance

Results of the multiple regression analyses that evaluated the moderating effect of *Support* and *Conflict* on the relationship between illness perceptions at baseline and functional performance at follow-up are presented in Tables 28a and 28b. For the unadjusted regressions, *Conflict* appeared to modify the relationship between *Timeline* and functional performance at follow-up. However, when this relationship was tested after

Table 28a. The Moderating Effect of Support and Conflict on the Relationship Between Illness Perceptions (Identity, Timeline, and Consequences) and Functional Performance at Follow-Up (n=136)

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*
Dependent: **FUNCTIONAL PERFORMANCE** (Follow-Up)						
Independent:						
Identity, Support	.13	---	---	.11	---	---
Identity, Support, Identity * Support	.14	.00	.49	.11	.00	.85
Identity, Support, Funct. Perf.,[a] Identity * Support	.74	.00	.37	.73	.00	.80
Identity, Support, Funct. Perf.,[a] Demo/Clinical [b] Identity * Support	.75	.00	.35	.74	.00	.82
Dependent: **FUNCTIONAL PERFORMANCE** (Follow-Up)						
Independent:						
Timeline, Support	.03	---	---	.02	---	---
Timeline, Support, Timeline * Support	.03	.00	.92	.05	.03	**.04***
Timeline, Support, Funct. Perf.,[a] Timeline * Support	.73	.00	.74	.72	.00	.82
Timeline, Support, Funct. Perf.,[a] Demo/Clinical,[b] Timeline * Support	.74	.00	.59	.74	.00	.75
Dependent: **FUNCTIONAL PERFORMANCE** (Follow-Up)						
Independent:						
Consequences, Support	.05	---	---	.04	---	---
Consequences, Support, Consequences * Support	.06	.01	.29	.04	.00	.66
Consequences, Support, Funct. Perf.,[a] Consequences * Support	.73	.00	.99	.73	.00	.52
Consequences, Support, Funct. Perf.,[a] Demo/Clin.,[b] Consequences * Support	.74	.00	.84	.74	.00	.48

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed). a Functional Performance at baseline; b: Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

Table 28.b. The Moderating Effect of Support and Conflict on the Relationship Between Illness Perceptions (Personal Control, Treatment Control, and Coherence) and Functional Performance at Follow-Up (n=136)

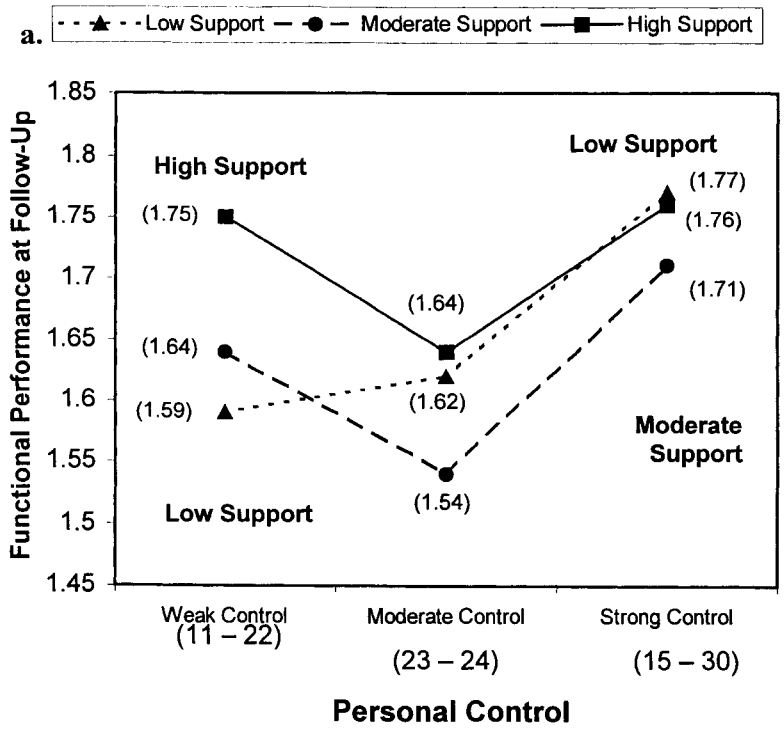
Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	p value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	p value *(for the interaction term)*
Dependent: **FUNCTIONAL PERFORMANCE** (Follow-Up)						
Independent:						
Personal Control, Support	.08	---	---	.07	---	---
Personal Control, Support, Personal Cont.* Support	.08	.00	.93	.08	.01	.20
Personal Control, Support, Funct. Perf.,[a] Personal Cont.* Support	.75	.02	.01**	.73	.01	.19
Personal Control, Support, Funct. Perf.,[a] Demo/Clin.,[b] Personal Cont.* Support	.76	.01	**.01****	.74	.00	.29
Dependent: **FUNCTIONAL PERFORMANCE** (Follow-Up)						
Independent:						
Treatment Control, Support	.17	---	---	.16	---	---
Treatment Control, Support, Treatment Cont.* Support	.18	.01	.15	.18	.02	.10
Treatment Control, Support, Funct. Perf., Treatment Cont.* Support	.73	.00	.80	.73	.01	.14
Treatment Control, Support, Funct. Perf.,[a] Demo/Clin,[b] Treatm. Cont.* Support	.75	.00	.69	.74	.01	.14
Dependent: **FUNCTIONAL PERFORMANCE** (Follow-Up)						
Independent:						
Coherence, Support	.04	---	---	.03	---	---
Coherence, Support, Coherence * Support	.05	.01	.36	.05	.01	.20
Coherence, Support, Funct. Perf.,[a] Coherence * Support	.73	.00	.79	.73	.00	.42
Coherence, Support, Funct. Perf.,[a] Demo/Clin.,[b] Coherence * Support	.75	.00	.93	.74	.00	.44

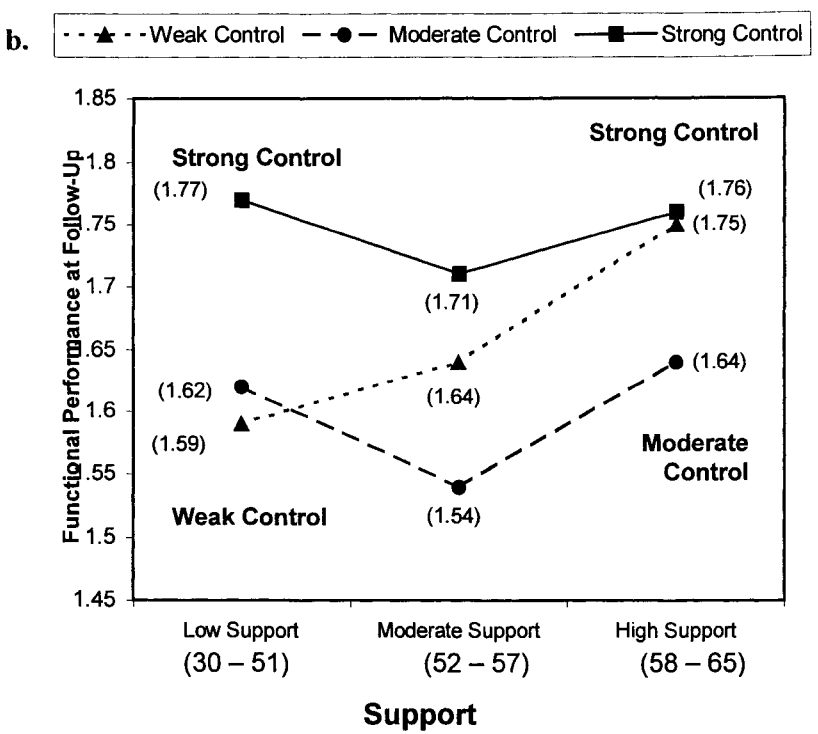
** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed). a Functional Performance at baseline; b: Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

controlling for functional performance at baseline, demographic and clinical covariates, this effect was not significant anymore. In contrast, when the regression analyses were adjusted for functional performance at baseline, the demographic and clinical covariates, *Support* modified the relationship between beliefs about *Personal Control* at baseline and functional performance at follow-up. Figure 4a suggests that in patients with lower *Support* at baseline (identified by the dotted line), weaker beliefs about *Personal Control* was related to lower levels of functional performance at follow-up (partial correlation coefficient r=.30, p=.07). This relationship was not significant in the moderate or higher *Support* group (p=.17 and p=.94 respectively).

Figure 4b suggests that in patients with weaker beliefs about *Personal Control* (dotted line), higher *Support* was related to higher levels of functional performance at follow-up (partial correlation coefficient r=.27, p=.07). However, support was less important in those with moderate or stronger beliefs about *Personal Control* (p=.32 and p=.55 respectively). This relationship supports the buffering role of support, with the presence of support conceptualized as a protective factor for better functional performance, and its absence, a vulnerability factor for lower functional performance, in situations of weak to moderate beliefs about *Personal Control.* The demographic and clinical characteristics of patients with different levels of *Personal Control* were contrasted with those of patients with different levels of *Support* for the scores of functional performance, but no major contrasts were noted. However, patients with weaker beliefs about *Personal Control* were less educated, they had lower LVEF, and were classified in NYHA class III

Figure 4. Graphical Display of the Moderating Effect of Support on the Relationship Between Personal Control and Functional Performance at Follow-Up (means adjusted for the demo/clinical covariates and baseline functional performance)





PARTIAL CORRELATION COEFFICIENTS:

Among low support (n=49): $r_{\text{Funct. and Pers.Control /cov}} = .30$ (p=.07)

Among moderate support (n=47): $r_{\text{Funct. and Pers.Control /cov}} = -.24$

Among high support (n=40): $r_{\text{Funct. and Pers.Control /cov}} = .02$

PARTIAL CORRELATION COEFFICIENTS:

Among weak control (n=59): $r_{\text{Funct. and Support /cov}} = .27$ (p=.07)

Among moderate control (n=52): $r_{\text{Funct. and Support/cov}} = -.16$

Among high control (n=25): $r_{\text{Funct. and Support/cov}} = -.18$

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

and IV or more severly limited. These factors may partially explain why *Support* had a greater impact on functioning in that group.

As a summary for the analyses on the moderating effect of support, results showed that the relationship between beliefs about *Personal Control* and depression at follow-up varied as a function of patients' perceived availability of *Support*, even after controlling for demographic and clinical covariates, and baseline measures of the dependent variables.

Therefore, hypothesis IIId was supported for *Personal Control*. In patients who reported weaker beliefs about *Personal Control*, higher levels of *Support* acted as a protective factor against depression, whereas lower levels of *Support* acted as a vulnerability factor for depression. This moderating role of *Support* was similarly observed for functional performance, whereby in patients who reported weaker beliefs about *Personal Control*, higher levels of *Support* acted as a protective factor better functional performance, whereas lower levels of *Support* acted as a vulnerability factor for lower functional performance. This result supported hypothesis Vd.

4.4.4 LONGITUDINAL ASSOCIATIONS BETWEEN DEPRESSION AND FUNCTIONAL PERFORMANCE

4.4.4.1 Influence of Baseline Depression on the Relationship Between Baseline Illness Perceptions and Functional Performance at Follow-up

Higher depression at baseline was significantly associated with lower functional performance at follow-up (See Table 21, $r = -.42^{**}$) . In order to determine whether the relationship between illness perceptions at baseline and functional performance at follow-up is due to the association of depression at baseline and functional performance at follow-

up, or to say it in another way, to determine whether depression at baseline partially accounts for the relationship between illness perceptions at baseline and functional performance at follow-up, the relationship between illness perceptions at baseline and functional performance at follow-up was assessed after controlling for the effect of baseline depression. More specifically, the moderating effect of *Support* on the relationship between *Personal Control* and functional performance at follow-up was assessed after controlling for the demographic and clinical covariates, functional performance at baseline, *Personal Control*, *Support*, and depression at baseline.

The partial *F* test showed that the moderating effect of *Support* on the relationship between *Personal Control* and functional performance at follow-up, remained significant in explaining variance in functional performance at follow-up, when depression at baseline was controlled for (R^2 change =.01, p=.01). The independent variables included were *Personal Control*, *Support*, their interaction term, functional performance at baseline, depression at baseline, and the relevant demographic and clinical covariates (age, sex, living alone, education, LVEF, and comorbidity).

4.4.4.2 Influence of Baseline Functional Performance on Depression at Follow-up

Similarly, the influence of functional performance at baseline on the relationships between illness perceptions at baseline and depression at follow-up was assessed, after controlling for functional performance at baseline, in addition to the demographic and clinical covariates, baseline depression, *Treatment Control*, *Personal Control* and *Support*, and their interaction term. Partial *F* test for the moderating effect of *Support* on the

relationship between *Personal Control* and depression at follow-up remained significant, given that demographic and clinical covariates, baseline depression, *Treatment Control*, *Personal Control* and *Support* were already controlled for (R^2 change for the interaction term = .01, p = .02).

4.5 SUMMARY OF THE RESULTS

Results of this study suggest that depression is highly prevalent in outpatients with CHF. Important variations in depression over time were observed for some patients, although for most patients, depression symptoms remain fairly stable over time. Patients were also functionally limited and showed little improvement over the follow-up period, but similarly, variations at the intra-individual level over time were identified for some patients.

Results of the cross-sectional analyses indicated that all illness perception variables were significantly associated with depression at baseline, when the effect of relevant demographic and clinical covariates was already taken into account. Higher depression at baseline was significantly associated with higher *Identity* perceptions, stronger beliefs about a long illness duration (*Timeline*), higher perceptions of serious *Consequences* of heart failure, weaker beliefs about the effectiveness of *Personal Control* and *Treatment Control*, and lower perceptions of *Coherence* or understanding of heart failure. Higher depression at baseline was also significantly associated with lower *Support* and higher *Conflict*. A summary of these results is presented in Table 29.

Table 29 Summary Table of the Results of the Cross-Sectional and Longitudinal Analyses (n=136)

	CROSS-SECTIONAL ANALYSES		LONGITUDINAL ANALYSES				
	Partial Correlation Coefficients[a] (r)		**Main Effects of Illness Perceptions[b]** (p value for R^2 change)			**Moderating Effect of Social Support[c]** (p value for R^2 change)	
	No adjustment	Adjusted for Demo/Clinical Covariates[d]	No adjustment	Adjusted for Demo/Clinical Covariates[d]	Adjusted for Demo/Clinical,[d] and Baseline Scores	Adjusted for Demo/Clinical Covariates[d]	Adjusted for Demo/Clinical,[d] and Baseline Scores
DEPENDENT VARIALBE: DEPRESSION							
ILLNESS PERCEPTIONS							
Identity	.40**	.37**	<.01**	<.01**	---	---	---
Timeline	.24**	.23*	.01**	.02*	---	---	---
Consequences	.59**	.54**	<.01**	<.01**	---	---	---
Personal Control	-.25**	-.30**	<.01**	<.01**	---	.04*	.05*
Treatment Control	-.32**	-.42**	<.01**	<.01**	<.01**	---	---
Coherence	-.41**	-.42**	<.01**	<.01**	---	---	---
SOCIAL SUPPORT							
Support	-.30**	-.29**	<.01**	<.01**	.01**		
Conflict	.28**	.27**	<.01**	<.01**	---		
DEPENDENT VARIABLE: FUNCTIONAL PERFORMANCE							
ILLNESS PERCEPTIONS							
Identity	-.32*	-.35**	<.01**	<.01**	---	---	---
Timeline	-.16	-.16	---	---	---	---	---
Consequences	-.24**	-.36**	.02*	<.01**	---	---	---
Personal Control	.25	.21*	<.01**	.02*	---	.01**	.01**
Treatment Control	.42**	.40**	<.01**	<.01**	---	---	---
Coherence	.18*	.24*	.03*	<.01**	---	---	---
SOCIAL SUPPORT							
Support	.05	.09	---	---	---		
Conflict	-.04	-.10	---	---	---		

** Correlation coefficient is significant at the 0.01 level (2-tailed). * Correlation coefficient is significant at the 0.05 level (2-tailed). a Partial correlation coefficients between illness perceptions and social support with depression and functional performance at baseline. b Main effects of illness perceptions and social support on depression and functional performance's ADJUSTED FOLLOW-UP SCORES. c Moderating effects of social support on the relationships between illness perceptions and depression and functional performance's ADJUSTED FOLLOW-UP SCORES. d Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

Similarly, higher functional performance at baseline was significantly associated with lower *Identity* perceptions, lower beliefs about a long illness duration (*Timeline*), lower perceptions of serious *Consequences* of heart failure, stronger beliefs about *Personal*, *Treatment Control*, and *Coherence*, higher *Support*, but with lower *Conflict*.

In the longitudinal analyses, the main effects of illness perceptions at baseline on depression and functional performance at follow-up were assessed after controlling for demographic and clinical covariates, and the baseline scores of depression and functional performance. These analyses showed that *Treatment Control* was the only illness perception variable to have a main effect on depression at follow-up.

As anticipated, analyses using the RESIDUAL CHANGE SCORES approach and the ADJUSTED FOLLOW-UP SCORES approach (after controlling for the baseline measure, the demographic and clinical covariates), produced similar results. These two approaches shared similarities in that they both adjust for the baseline measure of the dependent variable, and therefore allow us to better explore the contribution of the independent variables.

The buffering or vulnerability model of support was assessed in the relationships between illness perceptions at baseline and both depression and functional performance at follow-up. Results provided evidence for the buffering model of support. In patients who reported weaker beliefs about *Personal Control*, the presence of support acted as a "protective factor" against depression, and in its absence, a "vulnerability factor" for depression.

The moderating effect of support was also manifest in the relationship between *Personal Control* at baseline and functional performance at follow-up. In patients who reported weaker beliefs about *Personal Control*, higher levels of support acted as a "protective factor" against worse functioning. In contrast, this effect was absent in those with stronger beliefs about *Personal Control.*

Lastly, the moderating effect of *Support* on the relationship between *Personal Control* and depression at follow-up was not due to the association between baseline functional performance and depression at follow-up. The moderating effect of *Support* on the relationship *Personal Control* and depression at follow-up remained significant after controlling for baseline functional performance, in addition to baseline depression, the demographic and clinical covariates, *Treatment Control*, *Personal Control* and *Support.*

Similarly, the moderating effect of *Support* on the relationship between *Personal Control* and functional performance at follow-up remained significant after controlling for baseline depression, in addition to baseline functional performance, demographic and clinical covariates, *Personal Control*, *Support.*

CHAPTER 5. DISCUSSION

The present study explored the relationships between six dimensions of illness perceptions (*Identity*, *Timeline*, *Consequences*, *Personal Control*, *Treatment Control* and *Coherence*) and two aspects of social support at baseline (*Support* and *Conflict*), with depression and functional performance, in patients with CHF.

In the first part of the analyses, this study examined cross-sectional associations involving baseline illness perceptions and social support, and baseline depression and functional performance, both before and after controlling for demographic and clinical characteristics. The results indicated that illness perceptions at baseline were significantly associated with baseline depression and baseline functional performance. Higher *Identity* perceptions, stronger beliefs about a long illness duration (*Timeline*), higher perceptions of serious *Consequences* of heart failure, weaker beliefs about the effectiveness of *Personal Control* and *Treatment Control*, and lower perceptions of *Coherence* or understanding of heart failure, were significantly associated with higher depression, both before and after adjusting for demographic and clinical characteristics. Likewise, most of these illness perceptions were significantly associated with lower functional performance.

Lower *Support* and higher *Conflict* were significantly associated with higher depression, both before and after adjusting for demographic and clinical characteristics. However, neither *Support* nor *Conflict* was significantly associated with baseline functional performance, with or without adjustment for demographic and clinical characteristics.

In the second part of this study, longitudinal associations were examined after controlling for baseline measures of the dependent variables, in addition to demographic

and clinical characteristics. It was hypothesized that illness perceptions and social support would predict later depression and functional performance via direct or main effects, or indirectly, through the moderating effect of social support. These longitudinal analyses showed that beliefs about *Treatment Control* at baseline was the only illness perception variable that remained significant in predicting depression at follow-up, when the baseline measure of depression was accounted for. *Support* at baseline was found to moderate the association between *Personal Control* and depression at follow-up, such that in patients who reported weaker beliefs about *Personal Control* at baseline, *Support* was more strongly related to depressive symptoms at follow-up, compared with patientswith moderate or stronger beliefs about *Personal Control.*

Similarly for functional performance, *Support* was found to moderate the association between *Personal Control* and functional performance at follow-up, such that in patients with weaker beliefs about *Personal Control*, higher *Support* was related to higher functional performance at follow-up, whereas *Support* was less important in those with moderate or stronger beliefs about *Personal Control.* These longitudinal associations were independent of age, gender, education, living alone, LVEF, comorbidity, and the baseline measure of the dependent variable.

The following discussion focuses on five major findings: 1) the high prevalence of depression and the apparent stability in depression and functional performance over time; 2) cross-sectionally, the associations among illness perceptions, social support, depression and functional performance at baseline, and the demographic and clinical covariates; and longitudinally, 3) the significant main effects of *Treatment Control* and social support

(*Support*) on depression at follow-up; and 4) the moderating effect of *Support* on the relationship between *Personal Control* and depression at follow-up, and the moderating effect of *Support* on the relationship between *Personal Control* and functional performance at follow-up; and 5) the moderating effect of *Support* on the relationship between *Personal Control* and functional performance at follow-up, when the additional effect of baseline depression was taking into account; the main effect of *Treatment Control* on depression at follow-up when the additional effect of baseline functional performance was taking into account; and the moderating effect of *Support* on the relationship between *Personal Control* and depression at follow-up, when the additional effect of baseline functional performance was taken into account.

Lastly, the potential limitations of the present study are presented, and implications for practice and research are proposed.

5.1 PREVALENCE OF DEPRESSION

The present study demonstrated that depression is highly prevalent in outpatients with CHF, with 46.3% of patients (95% CI: 37.9, 50.6) reporting moderate to severe depression, as assessed with the CDS. There were apparent variations in depression over the follow-up period, and interestingly, only one-third of the depressed patients were receiving anti-depressant medication.

This prevalence figure is consistent with prior studies reporting depression in outpatients with heart failure,[29,81,88] but higher than the prevalence reported in other studies

of cardiac patients [10] or in patients with other chronic diseases such as stroke, [102] rheumatoid arthritis or cancer patients.[111,118]

5.1.1 SOURCES OF VARIATION IN PREVALENCE STUDIES OF DEPRESSION

When the results of the present study are compared with existing studies reporting prevalences of depression in patients with heart failure, a wide variation in the estimates is observed. This wide variation can be attributed in part to the heterogeneity of the patient populations studied in terms of sex and age. However, the influence of these demographic characteristics is not clear. For example, several authors have reported higher prevalence of depression in women with heart failure compared with men, and in younger patients compared to older patients with heart failure.[81,89,29] In other studies, a high prevalence of depression was reported in samples that included mostly men or older patients. In the Skotzko et al.' study (2000),[84] 42% of the outpatients were depressed (total sample n=33; 91% were men), and in the Rumsfeld et al. study (2003),[29] 30.2% of the outpatients were depressed (total sample n=460; 76% men). In the studies that included predominantly older patients with heart failure, Fulop et al. (2003)[90] found 36% of the inpatients depressed (mean age, 76.8; n=203), and Friedman et al. (2001)[154] found 30% of the inpatients depressed (mean age, 72.7; n=170).

Variations in the prevalence of depression can also be attributed to the setting from which patients were recruited, whether patients were hospitalized at the time of recruitment or whether patients were visiting an outpatient clinic. Indeed, Thomas et al.'s (2003) [30] recent review of the literature on depression among patients with heart failure concluded

that there is a higher prevalence among hospitalized patients with heart failure than in stabilized outpatient samples. The additional studies added to Table 1 to complement Thomas' review confirm this conclusion.

Recruitment bias may also be involved in the different prevalence estimates. For example, those studies that invited patients to participate by sending them a letter for recruitment [125] may have excluded the socially or educationally disadvantaged, and more importantly the uncooperative who may be particularly likely to suffer from depressive symptoms. Such a recruitment bias would lead to underestimates of the true prevalence of depression.

Variations in prevalence can also be attributed to the variety of the measures used. As previously mentioned, research on the assessment of depression has used two types of methods: the reporting of the presence or absence of the diagnosis of major depression[233] [234] and the reporting of the severity of depressive symptoms as a continuum.[235, 236] It has been suggested that clinical interviews elicit information different from that elicited by self-report measures of depressive symptoms, and therefore these interviews may provide a better assessment of depression. However, since most studies in the review have used self-report measures, the low specificity reported by some may have resulted in an overestimation of the prevalence of depression with these measures. Studies using self-report measures have also been reported using different threshold scores that result in different subdivisions and accordingly different reports on the prevalence or the severity of depressive symptoms. Thus, when comparing different estimates of the prevalence of

depression across the studies reviewed, the wide variations may in part be attributed to the heterogeneity of the measures used.

These variations can also be attributed to the sample size of the studies reviewed. A sample that is small will produce an estimate of the prevalence that is more likely to be imprecise and therefore misleading.[237,238] For example, for an anticipated prevalence of 35%, a sample size of 87 subjects will have a precision or margin of error of !10%; the precision will increase to !8% for a sample size of 137, and to !6% for a sample size of 243.

Last, and most importantly, it is unlikely that the sample sizes in the study reviewed were determined on the basis of prevalence estimation. The sample sizes in these studies were planned in accordance with the objectives and the expected results, which were, for the most part, the exploration of correlations and interrelationships among a set of psychosocial variables.

In conclusion, estimates of the prevalence of depression in the studies reviewed that included smaller sample sizes should be considered with caution. Such studies may not have been sufficient in size to truly estimate the prevalence of depression with a satisfactory level of precision. Studies with a satisfactory level of precision indicated that the prevalence of depressive symptoms in heart failure outpatients ranged from 30.2 % to 48%.[29,81]

Therefore, the estimate of the prevalence of depression in the present study is consistent with related studies in outpatients with CHF, which further confirms that depression is highly prevalent in this population. The present sample also compares with other studies in terms of age and percentage of women.[81,135]

The high prevalence of depression found in the present sample also raises the question of whether this prevalence estimate may reflect somatic factors, because several symptoms of depression and CHF overlap. For example, difficulty sleeping, fatigue, weight loss or gain, difficulty concentrating, and loss of strength, are symptoms that may arise directly from CHF, but they are also symptoms of depression. Very few authors have distinguished or excluded somatic depression symptoms within the assessment of depression, and most have advocated an inclusive approach to the assessment of depression in patient populations.

5.2 CROSS-SECTIONAL ASSOCIATIONS

5.2.1 ILLNESS PERCEPTIONS

The present study demonstrated fair degree of relationship between illness perceptions measured at baseline and depression and functional performance at baseline. Higher *Identity* perceptions, stronger beliefs about a long illness duration (*Timeline*), higher perceptions of serious *Consequences* of heart failure, weaker beliefs about *Personal Control* and *Treatment Control*, and lower perceptions of *Coherence* or understanding of heart failure, were significantly associated with higher depression at baseline. These associations remained significant after adjusting for demographic and clinical characteristics. Partial correlation coefficients among illness perceptions at baseline and depression at baseline ranged from .23 to .54. Similarly, for functional performance at baseline, most of these associations were observed, except for *Timeline*, *Support* and *Conflict*.

The present study adds to a growing body of research suggesting that illness perceptions may play a central role in physical and psychological adjustments among patients with a variety of chronic diseases. Our findings are consistent with research on the *Identity* dimension, [38,40-43] the *Control/cure* dimension, [38-40,42-45] and perceived *Consequences* of illness,[38,38-40,42,239] and similar related research on the concepts of perceived control,[46,133,135,240] or beliefs about prescribed medicine in controlling illness. [241]

In the present study, higher *Identity* perceptions and higher perceptions of *Consequences* of heart failure were associated not only with higher depression, but also with lower functional performance. This finding is consistent with research in patients with other chronic illnesses in which higher *Identity* perceptions and higher perceived *Consequences* of illness have been linked to worse physical, role and social functioning, as well as higher depression. [38-40,43] It is conceivable that patients who associate a greater number of their symptoms with heart failure, may in fact be more limited in their functioning, simply because they are experiencing a greater number of symptoms. These symptoms, together with beliefs about long illness duration and more severe *Consequences* of their illness, may lead to more depression. Other studies on related constructs showed that perceived intrusiveness of disease on daily activity and perceptions of how the subject's illness interferes with or affects personal and social behavior, [242] were significantly associated with depression and adjustment.

Higher beliefs about *Personal Control* and higher beliefs about the effectiveness of *Treatment Control* were significantly associated with lower levels of depression and higher

levels of functional performance at baseline, after adjusting for demographic and clinical characteristics. Beliefs about personal and *Treatment Control*, either combined or as distinct dimensions, have been the most studied and the most relevant dimensions in studies that have used the revised or a previous version of the Illness Perception Questionnaire (IPQ-R). In these studies, perceptions of control were significantly related to physical and social functioning,[38,44,45] and psychosocial adjustment (as measured by anxiety, depression and hostility).[39,40]

Other studies assessing similar related constructs of perceived control have reported consistent results.[46] For example, in patients recovering from a cardiac event, Moser and Dracup [133] showed that higher perceptions of control as measured by the Control Attitude Scale at baseline were significantly associated with lower depression at 6 months, after adjusting for demographic and clinical characteristics. Similarly, in patients with CHF, Dracup et al. (2003)[135] reported that patients with high perceived control had significantly longer 6-minute walk distances and significantly less depression than those with low perceived control. These relationships were independent of demographic and clinical characteristics.

In recent work on a related line of research, perceived control in prescribed medications and adherence provide further support for the relevance of the concept of perceived control. Horne and Weinman (1999)[241] reported that in patients with chronic physical illness, beliefs about the necessity of prescribed medications for controlling illness were related to concurrent reported adherence. In their study, patients' beliefs about their medicines were assessed as the necessity of prescribed medication for controlling their

illness and as their concerns about the potential adverse consequences of taking them. The authors showed that higher beliefs about the necessity of medicines and lower concerns were more strongly related to higher adherence than clinical and sociodemographic factors that included gender, educational experience and the number of prescribed medications.

5.2.2 DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

Demographic and clinical characteristics explained very little of the variance in either depression or functional performance. Consistent with previous studies that reported a lack of an association between disease severity variables and mood, in the present study, disease severity (as assessed with LVEF and comorbidity) was not associated with depression, although it was associated with functional performance. Age, formal education and NYHA class were the demographic and clinical variables that showed significant associations with most illness perception variables.

Age. Our results that younger patients were more likely to report depressive symptoms compared with older patients with CHF is consistent with the available literature on heart failure.[29,81,89] However, younger patients also reported higher *Identity* perceptions or a greater number of symptoms as linked to heart failure, and they also reported higher perceptions of serious *Consequences* of heart failure, compared to older patients.

Leventhal et al (1997) [228] suggest that, older individuals are more likely to accept their symptoms as a sign of aging, rather than to attribute their symptoms specifically to their illnesses, regardless of the severity and duration of the symptoms. Such misattribution can lead to an increase difficulty for the aged to distinguish the symptoms that are specific

to their illness, from those that are attributed to normal aging. This may explain why, in the present study, older patients were more likely to report lower *Identity* perceptions, that is, to report fewer symptoms as linked to heart failure. In fact, a recent study showed that older patients awaiting CABG surgery were more likely to believe old age was the cause of their coronary heart disease and significantly less likely to believe that genetics, health-damaging behaviors, health-protective behaviors and emotions had contributed to or caused their illness.[46]

In the present study, older patients were more likely to believe that their heart failure had less serious *Consequences* on their lives. This later finding was consistent with that reported in MI patients. Petrie et al. (1996) [44] reported that the younger patients were more likely to perceive that their MI would have more severe consequences for them.

Since older individuals are more likely to believe that normal aging is the cause of their illness and accept more easily their symptoms as a sign of aging,[46,228] these beliefs may explain why, in the present study, older CHF patients associated fewer symptoms with heart failure, had lower perceptions of serious consequences of their heart failure, and experienced less depression. Differences in illness perceptions between younger and older patients may partially explain why younger patients reported higher levels of depression.

Sex. The men were more likely than the women to have a diagnosis of heart failure secondary to ischemic heart disease. No other difference, namely in age, marital status, education, comorbidity, or in any of the illness perceptions or social support variables were observed. The relatively few women included in the present study prevented further evaluation of gender contrasts in relation to illness perceptions, depression and functional

performance. Prior research on quality of life among cardiac patients has included samples that consisted of mostly male patients. Recent studies that have examined gender differences in quality of life among cardiac patients indicate that women may experience greater impairments in physical quality of life than men.[243] The few studies that have also included an assessent of social support suggest that perceived social support is more relevant for quality of life among women than among men with cardiac disease.[244] Further research is needed addressing gender differences in response to CHF.

Education. Formal education and NYHA class were the other two demographic and clinical variables that showed a significant association with several illness perception variables. Patients who reported having completed high school had stronger beliefs about *Personal* and *Treatment Control*, they reported stronger beliefs about a long and chronic illness duration, and higher perceptions of serious *Consequences* of heart failure. One possible explanation for this is that those patients with higher levels of education, may have been more proactive in getting information on heart failure and treatment, or they may have had more opportunities for learning (e.g. access to internet, and educated friends with whom to share information). They may have had more opportunities to learn ways to manage their illness, leading to increased sense of control and confidence in treatment effectiveness. On the other hand, it is conceivable that higher educated patients had a more realistic view about long and chronic illness duration, and consequently anticipated more serious consequences of their heart failure.

5.3 LONGITUDINAL ASSOCIATIONS

5.3.1 ILLNESS PERCEPTIONS

The primary hypotheses of this study involved the main effects of each of the six dimensions of illness perceptions on depression and functional performance at follow-up. It was hypothesized that higher Identity perceptions, stronger beliefs about a long illness duration (*Timeline*), higher perceptions of serious *Consequences* of heart failure, weaker beliefs about the effectiveness of *Personal* and *Treatment Control*, and lower perceptions of *Coherence* or understanding of heart failure, would be related to higher levels of depressive symptoms at follow-up, and lower functional performance at follow-up, after controlling for the effect of demographic and clinical covariates, and the baseline measure of the dependent variable.

Results indicated that beliefs about the effectiveness of *Treatment Control* was the only illness perception variable that significantly contributed to the variance in depression at follow-up, when the demographic and clinical characteristics, and baseline measure of depression were taken into account. One possible explanation for this finding is that patients who have lower confidence in treatment effectiveness may feel more pessimistic about their illness, which may lead to more depression. Results from the correlational analyses are consistent with this view; patients with strong beliefs about long and chronic illness duration, who reported lower levels of understanding of heart failure, and weaker beliefs about *Personal Control*, also reported higher levels of depression at follow-up.

Longitudinal studies of depression in patients with rheumatoid arthritis, [42,245] psoriasis,[43] and chronic obstructive pulmonary disease [41] that have examined all six

dimensions of illness perceptions within the framework proposed by Leventhal [37] support the view that negative cognitive processes precede depression. For example, Sharpe et al. (2001)[239] showed that beliefs about serious consequences, when measured on six assessment occasions over a 21-month period, explained variance in depression at all assessments periods.

With regard to functional performance, the present study showed that beliefs about the effectiveness of *Treatment Control* did not predict later performance, when the baseline measure of performance was included in the analysis. This finding is contradictory to some of the recent studies in cardiac patients that documented the importance of illness perceptions in predicting physical, social functioning and mental health. In these studies, patients' expectations that their illness could be controlled, had a short duration, or had less serious consequences when measured on admission for a first MI, predicted later attendance at rehabilitation programmes, faster speed of return to work, and lower levels of subsequent disability. These studies are consistent with the hypothesis that positive beliefs are related to improved physical function.[44,45]

Several longitudinal studies that have included other forms of assessment of illness perceptions, such as expectations or health beliefs, provide further support for the central role of patients' perceived control in predicting physical recovery. For example, in a study of CABG surgery patients, Gump et al. (2001)[46] reported that those believing they had control over their heart disease were more likely to report that they had modified their exercise habits and diet, quit smoking, modified their drinking habits, and also reported that they were able to handle their emotions and attitudes better, at 6 months following surgery.

Although the authors relied on patients' reports of their postoperative behavior change following surgery, and used a single question to assess control over the disease, which could possibly have been related to the etiology of disease (participants were asked "How much control do you feel you had over the things that may have caused your illness?"), the authors showed that answers on perceived control were significantly associated with patients' reports of postoperative health protective behaviors.

In the present study, neither *Identity* perceptions, beliefs about illness duration (*Timeline*), perceptions of serious *Consequences* of heart failure, nor perceptions of *Coherence*, explained additional variance in either depression or functional performance at follow-up, when the baseline measures of these dependent variables were taken into account. This finding differs from that of previous studies of patients with chronic obstructive pulmonary disease, psoriasis, and RA, where strong identity perceptions[41-43] were associated with poorer physical and social functioning, and worse mental health and depression at one year. Patients who reported less perceived control[42,43] and more severe consequences of their illness [42] reported more visits at the clinic and more hospital readmissions at one year. In one study of patients with RA, beliefs in more severe consequences of illness explained significant variance in depression at 6 months, 15 and 21 months of follow-up, when the baseline measure of depression was accounted for.[239]

The high correlations found in the present study between baseline and follow-up measures, for both depression and functional performance (r =.84 for depression and r = .85 for functional performance) may partly explain why most illness perceptions failed to

predict either outcome at 4 months. The relatively small change in these outcome measures leaves little variance to be explained by the predictor variables.

It is also possible that illness perceptions may evolve over the course of the illness, and the relative short follow-up of the present study was not sufficient to identify how that change may relate to health outcomes. In fact, Leventhal suggests that illness representations will change over the lifetime, in part due to differences in the information people are exposed to, to differences in experiences, and changes in work and social roles affecting economic and social status.[228] These factors can certainly affect how CHF patients will view their illness. For example, some of the patients included in the study had been treated at the Heart Failure Clinic for almost two years, while others were recently diagnosed with heart failure and were newly treated at the clinic.

It is also possible that illness perceptions are established at an early stage of the illness, at the time where patients are diagnosed with heart failure, and they may remain fairly stable over the course of the illness despite exacerbations of patients' illness, and the variations in mood. In fact, Sharpe and al. (2001) [239] reported that in their sample of RA patients who reported an illness duration of less than 2 years, identity, control and consequence perceptions remained stable over six assessment occasions, at 3, 6, 9, 15 and 21 months, results that corroborate the findings of the present study.

Findings linking *Treatment Control* at baseline and depression at follow-up, and the moderating effect of social support on the relationship between *Personal Control* and depression, are important contributions of the present study. These relationships were examined while controlling for the demographic and clinical characteristics, and the

baseline measure of depression, and suggests that these relationships may be particularly robust.

5.3.2 SOCIAL SUPPORT

The present study examined both the positive aspects of social support (characterized by *Support* or the availability of helping behaviors by persons with whom patients were engaged in relationships), as well as negative aspects of social support (characterized as *Conflict* or perceived discord or stress in relationships). The associations of *Support* and *Conflict* with depression and functional performance were explored through their main effect on depression and functional performance at follow-up, and through their moderating effect on the relationships between illness perceptions and depression and between illness perceptions and functional performance at follow-up. It was hypothesized that lower *Support* and higher *Conflict* at baseline would be related to higher depressive symptoms and lower functional performance at follow-up, after controlling for the effect of demographic and clinical covariates, and baseline measure of depression. Moreover, it was hypothesized that the magnitude of the relationship between baseline illness perception variables and depression at follow-up would vary as a function of *Support* and *Control*, after taking into account the demographic and clinical covariates, and the baseline measure of depression.

Results indicated that lower *Support* significantly contributed to the variance in depression at follow-up, when the demographic and clinical covariates, and the baseline measure of depression were taken into account. *Conflict* did not contributed to the variance

in depression at follow-up, and neither *Support* nor *Conflict* contributed to the variance in functional performance at follow-up.

While some studies have reported that negative aspects of support are better predictors of psychological symptoms than positive aspects,[159,161,162,164] this finding was not observed in our sample of CHF patients. *Conflict* was strongly related to higher depression at follow-up, but it did not remain significant in the longitudinal analyses of depression. Our findings suggest that positive aspects of support may be a better predictor of depression than the negative aspects of support in CHF patients. In fact, perceived *Support* was more strongly associated with beliefs about *Personal* and *Treatment Control*, than perceived *Conflict* in relationships. This may explain why the presence of support was related to depression in the longitudinal analyses.

In the present study, the magnitude of the relationship between beliefs about *Personal Control* at baseline and depression at follow-up varied as a function of the level of *Support* at baseline. In patients with weaker beliefs about *Personal Control*, higher *Support* was related with lower levels of depression; whereas in patients with moderate or stronger beliefs about *Personal Control*, this association between *Support* and depression was negligible. This finding supports the buffering or vulnerability model of social support[35 166,167] According to this model, it is possible that in patients who reported weaker beliefs about personal control, the presence of support acted as a "protective factor" against depression. In fact, these patients may be more vulnerable to depression, and thus, the presence of a supportive network may have encouraged them to take a more active role in their care, which in turn may reduce depression. In contrast, patients who reported

moderate or stronger beliefs about personal control, were less vulnerable to depression, and thus, the influence of support was less apparent.

With regard to functional performance, *Support* also appeared to moderate the relationship between *Personal Control* at baseline and functional performance at follow-up. One possible explanation for this is that, in patients with more negative beliefs about *Personal Control*, the presence of a supportive network may motivate them to adhere to prescribed recommendations, and it may encourage patients to take an active role in their care, which may result in better functioning. Alternatively, the influence of *Support* may be less or absent in those patients who already report stronger beliefs about *Personal Control*, and therefore better functioning. Moreover, the failure of *Support* to exhibit a statistically significant direct or main effect on functional performance at follow-up is noteworthy, and suggests that *Support* may be relevant to functional performance only through its association with beliefs about *Personal Control*.

Although very few studies have examined the contribution of social support to psychosocial and physical outcomes in patients with heart failure, some of these studies have demonstrated the predictive role of support [62,64,185,186] while others have failed to report such an association.[246] Other studies of cardiac patients have provided evidence that social support is an important risk factor for recurrent hospital readmission and mortality.[172,183]

The results of the present study provide a preliminary insight into the possible way that positive aspects of social support may influence depression and functioning in patients

with heart failure, and underscore the importance of exploring social support together with illness perceptions. Further research is needed that will address these interrelationships.

5.3.3 DEPRESSION AND FUNCTIONAL PERFORMANCE

In the present study, higher depression at baseline was significantly associated with lower functional performance at follow-up. The influence of depression at baseline on the relationships between illness perceptions and functional performance at follow-up was therefore explored. It was hypothesized that the relationships between illness perceptions and functional performance at follow-up would remain significant, even after controlling for depression at baseline, in addition to the demographic and clinical covariates, and the baseline measure of functional performance. Results indicated that the moderating effect of *Support* on the relationship between *Personal Control* and functional performance at follow-up remained significant, when depression at baseline was taking into account. These results support the importance of illness perceptions in predicting functional performance for CHF patients.

Similarly, the influence of functional performance at baseline was explored on the relationship between illness perceptions at baseline and depression at follow-up, after controlling for functional performance at baseline, in addition to the demographic and clinical covariates, and the baseline measure of depression. It was hypothesized that the relationships between illness perceptions at baseline and depression at follow-up would remain significant, even after controlling for functional performance at baseline, in addition to the demographic and clinical covariates, and the baseline measure of depression.

Results indicated that both the main effect of *Treatment Control* and the moderating effect of *Support* on the relationship between *Personal Control* and depression at follow-up remained significant, given that functional performance at baseline, the demographic and clinical covariates, and the baseline measure of depression were controlled for. These results support the importance of illness perceptions in predicting depression for CHF patients, even after adjustment for functional performance.

Overall, the result of this study support the contribution of illness perceptions to both depression and functional performance in patients with CHF, and that interventions that modify or take into account patients' illness perceptions may have the potential to improve functioning, above and beyond depression treatment.

5.4 LIMITATIONS

Some limitations inherent to the present study must be acknowledged. They concern mainly the temporality of the observed associations, the generalizability of the study results, and some methodological issues that relates to the choice of the study instruments, translation issues and statistical issues.

5.4.1 TEMPORALITY OF THE OBSERVED ASSOCIATIONS

Although a definite set of hypotheses were formulated that describe the directions of the anticipated associations, due to the psychosocial nature of the study variables and their mutual influence, the interpretation of the directions of these relationships remain mainly exploratory. It is possible that the relationships between illness perceptions and both

depression and functional performance may be bi-directional. Rather than negative beliefs leading to depression, it is also possible that patients with depressive symptoms are more likely to interpret their illness negatively as a consequence of their depressed mood. Similarly, rather than negative beliefs leading to lower levels of functional performance, performance may determine beliefs about personal control. Lack of social support may also be the result of depression, rather than its cause. Certainly, depressive symptoms, such as loss of pleasure, loss of interest, and loss of energy, could lead to reduced interactions with others and result in decreased support.

The theoretical framework proposed in the present study was that negative beliefs would lead to worse depression and functional performance. This view is compatible with the research on the etiology of depression that proposes various physiological mechanisms and behavioral mechanisms linking depression to cardiovascular outcomes.[122,247]

5.4.2 GENERALIZABILITY

The results of this study are also limited in generalizability to the type of CHF patients who satisfied the selection criteria, and to those who were willing and able to complete psychosocial interviews. While the subjects were representative of the patients seen at the Heart Failure Clinic of the Montreal Heart Institute, because the Montreal Heart Institute is a referral center, the subjects included in this study do not represent all patients with heart failure, nor are they representative of CHF patients seen in other outpatient clinics or hospitals.

The present study sample was representative of a heart failure clinic population that included fewer women than men, and thus the findings of the present study are limited in terms of their ability to being generalized to female patients. The small proportion of women in our sample (18.4%) is comparable to other studies of CHF outpatients that have used similar inclusion and exclusion criteria. For example, Gottlieb and al. (2003) [81] reported 21% of women in their sample of 155 outpatients with heart failure recruited between December 2000 and December 2001. Similarly, Dracup and al. (2003) [135] reported 18.5% of women out of 222 outpatients with heart failure recruited between September 1998 and October 2000.

There has been a paucity of research examining women's experience with heart failure, and none have specifically examined illness perceptions in relation to heart failure. The available research suggests that the experience of adjustment to illness may be different in women compared with men, although some recent work suggests that these differences may be minimal in CHF patients.[248] The sample size and the relatively few women in this study prevent further exploration of gender differences in relation to illness perceptions and depression.

5.4.3 OTHER METHODOLOGICAL ISSUES

Another limitation of the present study concerns the choice of the CDS for measuring depression. Although the CDS was chosen for the assessment of depression because it presented advantages in terms of the type of patients studied and for its sensitivity for statistical purposes, a disease-specific measure of depression such as the

CDS precludes comparisons with normative samples and comparisons of levels between groups of patients with different conditions. A generic measure of depression, used as a second additional instrument for measuring depression, should probably be chosen for a similar future study. This would allow one to more specifically describe the importance of depression in CHF patients in comparison with other patient groups, and to further contribute to validation studies of the CDS.

Another potential concern involves the possible biases in the use of translated instruments, namely the French translation of the CDS and of the FPI used in the present study. Validity analyses were carried out on both scales in the present data set, and the obtained results paralleled other validation studies. These results, together with that of the reliability analyses conducted for these two instruments, suggest that the French translations had sounds psychometric properties for use in the present study.

5.5 METHODOLOGICAL STRENGTHS

Despite these limitations, the present study has several strengths. First, the prevalence of depression was examined in a relatively large sample of outpatients with heart failure, it used inclusive criteria and included patients as young as 38 years of age, and had a very high retention rate. This provides a valuable estimate of the prevalence of depression in outpatients with heart failure, and contributes to the generalizability of the study findings.

Second, the present study examined both the positive aspects of social support, characterized by *Support*, and the negative aspects of social support characterized as

Conflict. The contributions of *Support* and *Conflict* to depression and functional performance outcomes were explored both as a main effect, and through their moderating effect or association with illness perceptions.

Third, this study examined the interrelationships between illness perceptions, social support, depression and functional performance using two approaches, cross-sectional, and longitudinal. In the cross-sectional approach, the interrelationships between the psychosocial and outcome variables were examined without making any assumptions about the temporality of the observed associations. Results suggested that all illness perceptions significantly contributed to the variance in depression, even after other demographic and clinical variables were controlled. Similarly, most illness perceptions significantly contributed to the variance in functional performance, even after other demographic and clinical variables were controlled.

The longitudinal approach allowed examination of their interrelationships while controlling for the additional effect of the baseline measure of the outcome variables. Although the benefits of a longitudinal approach were limited due to the relative stability of depression and functional performance over the follow-up period, results showed that beliefs about *Personal* and *Treatment Control* significantly contributed to the variance in depression and functioning at follow-up, when the baseline measures were controlled. Moreover, because of the relative stability of both dependent variables, and because illness perceptions and social support variables were assessed at baseline only, the interpretation of the temporality of these relationships remained exploratory.

5.6 IMPLICATIONS FOR PRACTICE

The present study has implications for the management and care for patients with heart failure. Results of the present study add to the evidence from prior studies and provide further evidence that the prevalence of depression in CHF patients is particularly high.

Although there has been a growing body of literature providing evidence that depression is highly prevalent in CHF patients, it is associated with worse physical functioning [27,29] and adverse outcomes such as repeated readmissions[28] and mortality,[82] many reports have criticized the fact that very few attempts have been made to address routine evaluation of depression screening in the CHF population.[249] The need for improved recognition of depression in the cardiovascular population has been widely acknowledged. In particular, depressed individuals with suicidal ideation should be referred for psychiatric consultation.

Because CHF patients' negative beliefs about *Personal Control* and *Treatment Control* may be associated with increased depression and decreased functional performance, these topics need to be explored in encounters with patients. Eliciting patients' beliefs about their illness can serve to establish the basis for initiating discussions with patients, and for assessing patients' learning needs. This may foster a closer partnership, which would increase the sense of trust and reliance on the nurse. However, patients can sometimes be hesitant to share their personal views of their illness, because their perceptions may be different from medical views.[44] For example, patients consulting at the heart failure clinic may expect to have an improvement in their symptoms and an

enhancement of their functioning, while the health professionals' goal may rather be directed at maintaining present status and limiting the progression of the symptoms. Such discrepancies in treatment expectations may lead to a misunderstanding of treatment recommendations, and to dissatisfaction with treatment outcomes.

Finally, nursing practice encourages patients to take responsibility for many aspects of their illness. Negative beliefs about personal and treatment control may limit patients' self-care.

5.7 IMPLICATIONS FOR RESEARCH

This study provides a better understanding of patients' beliefs of their illness, and provides theoretical grounds for guiding research in heart failure. Several recommendations for further research into the importance of illness perceptions in CHF patients are proposed.

Further consideration should be given to Leventhal's self-regulatory model for understanding patients' adjustment to CHF. According to Leventhal's self-regulatory model, and in the context of heart failure, patients try to understand their illness and develop cognitive representations of the meaning of their illness in six areas: *Identity* (whether their symptoms are linked to heart failure), *Timeline* (the duration of their heart failure), *Consequences* (whether their heart failure will affect their them), *Personal* and *Treatment Control* (whether they, or the treatments can exert a certain control over their heart failure), and *Coherence* (their understanding of heart failure). Their cognitive representations of what heart failure is for them, or self-regulations, will in turn influence their emotional response, coping behaviors and health outcomes.

The present study suggests that Leventhal's self-regulation model provides a valuable framework for understanding the relationships between illness perceptions and depression and functional performance in CHF patients. Unfortunately, few studies have explicitly used this framework to guide investigation of how illness perceptions may influence depression and other psychosocial outcomes in cardiac patients.

Additional longitudinal research is needed to better clarify the role of illness perceptions to depression and functioning among in patients with CHF, and establish a temporal relationship among the study variables. Since it has been suggested that illness perceptions may change with disease progression and responses to treatment, longitudinal studies assessing illness perceptions in patients early after the diagnosis of heart failure, those measuring changes in perceptions over a longer period of time and concurrent change in depression and functional performance, are needed.

Leventhal's self-regulation model may also be relevant for understanding non-adherence. According to Horn (1997),[250] patients' representations of the illness in terms of their beliefs about the effectiveness and appropriateness of proposed treatments, will guide their decision to follow prescribed recommendations. A lack of understanding or *Coherence* between their views about the illness, the symptoms they experience, the prescribed treatments, and a discrepancy between the health professionals' recommendations and the patients' views of their illness, may lead to non-adherent behavior. Unfortunately, research in adherence has rarely explored patients' beliefs about treatment. Thus, using Leventhal's self-regulation model to explore how patients' beliefs

about *Treatment Control* relates to adherence behavior, could provide valuable insight into research on adherence.

Furture research is needed on illness perceptions of understudied CHF subgroups, particularly women and caregivers of CHF patients. Few studies compared the experience of men and women adjusting to CHF, and the available studies have often produced inconsistent results.[243,248,251] Althoug very few studies have specifically explored gender difference in health perceptions, some studies indicated that women perceive their health as better than the men, and have more positive meaning to their illness than men, although women have lower functional status. Women may have different beliefs about their illness and different expectations in relation to functioning, and these expectations may explain the observed differences in adjustment and functioning. Very few studies have explored how women manage their illness. Further research exploring difference between men and women in illness perceptions is certainly needed.

Lastly, Leventhal's self-regulation model may be particularly valuable for designing and testing interventions that would target negative beliefs. This framework had been used successfully to develop and test interventions in rheumatoid arthritis[252] and interventions in cardiac rehabilitation.[134] Future randomized controlled trials of interventions to reinforce positive beliefs and increase support in patients with heart failure, within the framework of Leventhal's self-regulation model are needed.

Psychosocial interventions aimed at changing people's cognitive representations may constitute an important mechanism by which psychosocial interventions may influence behaviour and psychological adjustment in CHF patients. In particular, the

present study suggests that interventions designed to enhanced patients' beliefs about *Personal* and *Treatment Control* and reinforce social support, may have the most potential to influence depression and improve functional performance either directly, or through the moderating effect of social support. Such interventions might include strategies that would held patients responsible for several aspects of their care, for example, involving patients in the choice of their treatment alternatives and lifestyle changes, and providing information to facilitate self-care and self-monitoring (e.g. daily weight assessment, diuretics managed by the patient, and recognition of exacerbation of symptoms). Providing CHF patients with opportunities to share their views about heart failure and treatment effectiveness, through group discussions or through the support of an experienced peer, may also represent an added opportunity to alter negative beliefs about illness.

CONCLUSION

The present study adds to a growing body research on the importance of concurrent depression in patients with CHF. It provided a valuable estimate of the prevalence of depression in outpatients with CHF. To the author's knowledge, this is the first study that examined illness perceptions in patients with heart failure from the point of view of Leventhal's self-regulatory model. The findings documented the interrelationships among illness perceptions, the positive and negative aspects of social support, and depression and functioning in patients with CHF.

The longitudinal approach to analysis identified domains of illness perceptions that may be of particular relevance for predicting depression and functional performance in

patients with CHF. The independent contributions of patients's beliefs about personal and treatment control to later depression and functioning suggest that negative views about illness play an important role in patients adjusting to CHF. The present study extends previous work that documented the importance of illness perceptions in predicting mental health and functioning.

Findings of the present study suggest a number of implications for practice and research. Results of this study confirm the need for improved recognition of depression in patients with CHF. Further longitudinal studies are needed to better clarify the temporality of the associations between illness perceptions, depression, and functioning. Studies addressing how patients' beliefs about treatment control relate to adherence behavior, could provide valuable insight into research on adherent behavior. Interventions designed to strengthen patients' beliefs about personal control and the effectiveness of *treatment control,* and reinforce social support, may have the potential to influence depression and improve functional performance in CHF patients. Overall, findings of the present study add to the growing evidence emphasising the importance of illness perceptions in health outcomes.

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APPENDIX A Prevalence of Depression in Patients with Stroke, Rheumatoid Arthritis and Cancer

A-1 Studies of Depression in Patients with Stroke

Author	Sample size	Sex M/F	Mean Age Range	Screening Tools	% Depressed
Aström & al. 1993	80	49/31	44 - 100 mean: 73	DSM-III	In-hospital: 25% major dep. 3 mo: 31% major dep. 12 mo: 16% major dep. 3 years: 29% major dep.
Burvill & al. 1995 [93]	294	164/130	26 – 90	PAS	4 mo : 23% (15% major dep., 8% minor dep.)
Dam 2001 [94]	99	65/34	mean: 57	HDRS BDI	7 years: 20% (6% major dep., 13% minor dep.)
House & al. 1991 [95]	128	58/70	18 – 96 mean: 71.2	DSM-III BDI	1 mo: 11% major dep.; 32% (BDI≥10) 6 mo: 9% major dep.; 32% (BDI≥10) 12 mo: 5% major dep.; 16% (BDI≥10)
Kauhanen & al. 1999	106	60/46	19 – 82 mean: 65.8	DSM-III-R	3 mo: 53% (9% major dep., 44% minor dep.) 12 mo: 42% (16% major dep., 26% minor dep.)
Kim & Choi-Kwon 2000 [96]	148	94/54	mean: 62	DSM-IV	2-4 mo: 18% major dep.
Morris & al. 1990 [98]	99	51/48	39 – 90 mean : 70.8	CIDI MADRS	2 mo: 32% (14% major dep., 18% minor dep.) 14 mo: 12% (7% major dep., 5% minor dep.)

BDI, Beck Depression Inventory; CIDI, Composite International Diagnostic Interview; DSM-III, Diagnostic and Statistical Manual; HDRS, Hamilton Depression Rating Scale; MADRS, Montgomery and Asberg Depression Rating Scale; PAS, Psychiatric Assessment Schedule.

A-2 Studies of Depression in Patients with Stroke

Author	Sample	Sex M/F	Mean Age	Tool	% Depressed
Ng & al. 1995 [103]	52	29/23	mean: 60	DSM-III-R HDRS	21 days: 55% (35% mildly, 19% moderately 1% severely dep.)
Phojasvaara & al. 1998 [102]	486	---	55 – 85	DSM-III-R BDI	3-4 mo: 40% (26% major dep., 14% minor dep.) 37.7% (BDI≥10)
Robinson & al. 1982 [100]	103	45/58	mean: 63	GHQ	0-5 mo: 13% 6-24 mo: 45% 3-4 years: 22%
Robinson & al. 1987 [97]	37	21/16	mean: 63	HDS Zung	12 mo: 14% major dep., 18% minor dep.
Sinyor & al. 1986 [104]	64	39/25	---	SDS	In-hopistal: 47% (22% moderate to severe, 25% mild dep.)
Sharpe & al. 1994 [97]	60	37/23	---	SCID	3-5 years: 18% (8% major dep., 10% minor dep.)
Sturn & al. 2004	226	116/110	mean: 73	Irritability, Depression Anxiety Scale	2 years: 26%

BDI, Beck Depression Inventory; CIDI, Composite International Diagnostic Interview; GHQ, General Health Questionnaire; HDS, Hamilton Depression Scale; HDRS, Hamilton Depression Rating Scale; MADRS, Montgomery and Asberg Depression Rating Scale; SCID, Structured Clinical Interview for DSM-III; Zung, Zung Depression Scale.

A-3 Studies of Depression in Patients with Rheumatoid Arthritis

Author	Population	Sample	Sex M/F	Mean Age	Tool	% Depressed
Abdel-Nasser & al. 1998	Out-patients	60	12/48	mean: 39.7	SCL-90-R-D	23.3%
Büchi & al. 1998	Out-patients	89	16/73	mean: 61.3	HADS	31% (≥8)
El-Miedany YM. & al. 2002 [106]	Out-patients	80	9/71	mean: 41.9	ICD-9	66.2%
Frank & al. 1988 [111]	Out-patients	137	33/104	18-78 mean: 58.3	DIS	42.3% (17% major dep.)
Hawley & Wolfe 1993 [110]	Outpatients	1,152	70.6% women	mean: 56	AIMS	25% (≥3.75) 20.4% (≥4)
Katz & Yellin 1993 [107]	Out-patients	648	158/490	mean: 54	GDS	4 years F-U: 15-17%
Creed & al. 1990; [105] and Murphy & al. 1988 [108]	Out-patients (57); in-patients (23)	80	16/64	18-78 median: 62	PAS CIS	17.5 - 21.5%
Pincus T. & al. 1996 [109]	Outpatients	163	72% women	mean: 61.2	HADS	15% (≥11)
Söderlin & al. 2000	Outpatients	91	32/59	mean: 58.8	AIMS	19% (≥4)
Yukioka M. & al. 2002	Inpatients and outpatients	287			Zung	39%

AIMS, Arthritis Impact Measurement Scales; CIS, Clinical Interview Scale; DIS, National Institute of Mental Health Diagnostic Interview Schedule; GDS, Geriatric Depression Scale; HADS, Hospital Anxiety and Depression Scale; PAS, Psychiatric Assessment Schedule; SCL-90-R-D, Symptom Checklist-90-Revised.

A-4 Studies of Depression in Patients with Cancer

Author	Population	Sample	Sex M/F	Mean Age	Tool	% Depressed
Berard & al. 1998 [114]	Cancer out-patients	456	113/343	mean: 51.8	HADS	14% (HADS>8)
Brown & al. 2003 [115]	Cancer out-patients	205	42/153	mean: 55-57	CES-D	8 – 9%
Bukberg & al. 1984	Cancer in-patients	62	32/30	23 – 70 mean: 51	Modified DSM-III	42% major dep.: (24% severe, 18% moderately severe symptoms)
					Hamilton Rating Scale	15% (Ham.≥21)
					BDI	33% (BDI ≥14)
Dean C. 1987 [118]	Mastectomy out-patients	122	Women	20 – 60 mean: 48.7	GHQ	3 mo: 27.4% (9.7% major dep., 17.7% minor dep.) 12 mo: 22.7% (4.5% major dep., 18.2% minor dep.)
Derogatis & al. 1983	Out-patients (84); In-patients (131)	215	105/110	mean: 50.3	SCL-90-R RDS	6% (major affective disorders); 12% (adjustment disorders with depressed mood)

BDI, Beck Depression Inventory; GHQ, General Health Questionnaires; HADS, Hospital Anxiety and Depression Scale; RDS, Ranking Depression Screen.

A-5 Studies of Depression in Patients with Cancer

Author	Population	Sample	Sex M/F	Mean Age	Tool	% Depressed
Hughson A.V.M. & al. 1988	Mastectomy out-patients	70	Women	mean: 53.7	GHQ	32, 24, 20, 15, and 13% at 1, 3, 13, 18, and 24 mo.)
Kissane & al. 1998 [116]	Mastectomy out-patients	303	Women	mean: 46	MILP HADS	36.6% depression (9.6%, major dep., 27% minor dep.)
Lloyd-Williams & Friedman 2001 [112]	Cancer in-patients	100	56/44	25 – 69 mean: 57	PSE	22%
Pascoe S. & al. 2000 [117]	Cancer out-patients	504	227/277	20 – 93 median: 62	HADS	7.1% (≥10)
Razavi & al. 1990 [113]	Cancer in-patients	210	69/141	mean: 55.3	HADS	11% (8-10) 7.8% - 25.5% major dep.

BDI, Beck Depression Inventory; GHQ, General Health Questionnaires; HADS, Hospital Anxiety and Depression Scale; MILP, Monash Interview for Liaison Psychiatry; PSE, Present State Examination Interview; RDS, Ranking Depression Screen.

APPENDIX B Ethical Approval from the Montreal Heart Institute and McGill University Institutional Review Board

Institut de Cardiologie de Montréal
5000 est, rue Bélanger, Montréal, Qué., H1T 1C8 — Tél.: (514) 376-3330

Le 14 février 2002

Docteur Nicole Parent
Centre de recherche
Institut de Cardiologie de Montréal

Objet **#01-094** **Illness perceptions, Depression, Performance and Heart Failure**

Chère Madame Parent,

Je prends acte de votre lettre en date du 1er février 2002 répondant avec satisfaction aux questions ou commentaires du Comité concernant :

- **La faisabilité de ce projet compte tenu du nombre de patients.**
- **La durée d'administration des questionnaires.**
- **Le critère d'exclusion pour les patients qui présentent un trouble cognitif ou de mémoire significatif.**
- **La condition médicale du patient au moment du suivi à 2 mois.**
- **L'obtention des informations auprès de la Régie de l'assurance santé et de l'assurance hospitalisation.**
- **L'autorisation du Directeur des services professionnels et hospitaliers.**

Ce projet a été approuvé par le Comité interne de la recherche en date du 4 février 2002.

Le début du recrutement dans ce projet est autorisé.

Vous trouverez, ci joint, une copie du formulaire de consentement en français et anglais, version #1 datée du 08 janvier 2002.

Veuillez agréer, chère Madame Parent, l'expression de mes sentiments les plus distingués.

Raymond Martineau, M.D., FRCPC
Président
Comité d'éthique de la recherche et des nouvelles technologies
RM/gb

p.j. : (1)
01-094-Debut14fev02

Institut de Cardiologie de Montréal
5000 est, rue Bélanger, Montréal, Qué., H1T 1C8 — Tél.: (514) 376-3330

Montréal, le 12 février 2002

Madame Nicole Parent
Département d'Épidémiologie
Université McGill

OBJET : Demande de consultation des dossiers médicaux
Projet 01-094

Chère madame Parent,

J'ai bien reçu votre lettre du 7 février 2002 et il me fait plaisir d'accéder à votre demande de consulter les dossiers médicaux des patients dans le cadre du projet 01-094 intitulé «The Role of Illness Perceptions in Relation to Depression and Functional Performance in Men and Women with Heart Failure».

Je vous souhaite bon succès dans votre projet et vous prie de recevoir l'expression de mes sentiments distingués.

Le directeur des services
professionnels et hospitaliers,

Martin Juneau, MD, FRCP.

MJ/fl

cc : Dr Raymond Martineau
président du comité d'éthique de la recherche

Mme Ginette Bédard, responsable des archives

McGill

Faculty of Medicine
3655 Promenade Sir William Osler
Montreal, QC H3G 1Y6

Faculté de médecine
3655, Promenade Sir William Osler
Montréal, QC, H3G 1Y6

Fax/Télécopieur: (514) 398-3595

March 20, 2002

Dr. Nancy Frasure-Smith
McGill University
Department of Psychiatry
1033 Pine Avenue West
Montreal, Quebec
H3A 1A1

Dear Dr. Frasure-Smith:

The study entitled "The Role of Illness Perceptions in Relation to Depression and Functional Performance in Men and Women with Heart Failure", was presented for corroborative approval, on behalf of your PhD candidate Nicole Parent, at the Full Board meeting of the IRB on March 19, 2002.

We are pleased to inform you that approval was provided by the Board and enclosed you will find the certificate of approval.

Yours sincerely,

J. Lawrence Hutchison, M.D.
Chair
Institutional Review Board

cc: Ms. Nicole Parent
A03-B16-02A

McGill

Faculty of Medicine
3655 Promenade Sir William Osler
Montreal, QC H3G 1Y6

Faculté de médecine
3655, Promenade Sir William Osler
Montréal, QC, H3G 1Y6

Fax/Télécopieur: (514) 398-3595

CERTIFICATION OF ETHICAL ACCEPTABILITY FOR RESEARCH INVOLVING HUMAN SUBJECTS

The Faculty of Medicine Institutional Review Board consisting of:

has examined the research project **A03-B16-02A** entitled **"The Role of Illness Perceptions in Relation to Depression and Functional Performance in Men and Women with Heart Failure"**

as proposed by: Nancy Frasure-Smith (Applicant) to _____ (Granting Agency, if any)

and consider the experimental procedures to be acceptable on ethical grounds for research involving human subjects.

March 20, 2002 (Date) Chair, IRB Dean of Faculty

Institutional Review Board Assurance Number: M-1458

APPENDIX C Consent Forms

Institut de Cardiologie de Montréal
5000 est, rue Bélanger, Montréal, Qué., H1T 1C8 — Tél.: (514) 376-3330

RESEARCH PROJECT
ICM #01-094

PREDIR – **PRE**valence study of **D**epression in heart fa**I**lu**R**e patients

Principal investigator and collaborators

Nicole Parent, MSc, PhD candidate, Nancy Frasure-Smith, PhD, Jim Hanley, PhD,
François Lespérance, MD, Margaret Purden, PhD, Anique Ducharme, MD

INFORMATION

GENERAL DESCRIPTION

You are being asked to take part in a study at the Montreal Heart Institute because you have heart failure. Approximately 142 patients seen at the Heart Failure Clinic will take part in this study. Before you sign this informed consent form, please take as much time as you need to read (or have read to you) and understand the information written below. Please take the opportunity to ask the nurse investigator of this study any questions about this research study and your rights. She should be able to provide answers to all your questions.

Heart failure represents the most common cause of hospitalization for elderly patients, and is associated with significant limitations in physical and leisure activities. Likewise, depression is commonly reported among cardiac patients. Recent studies, some of which conducted at the Montreal Heart Institute, have suggested that depression can have a negative impact on cardiac prognosis. Other studies have also shown that patients' beliefs about their illness, or illness perceptions in relation to the signs and symptoms of their illness, beliefs about the course and the severity of their illness, and beliefs about the extent to which their illness is controllable, are all factors that can predict both physical and psychological outcomes. However, little is known about these factors in patients with heart failure. The purpose of this study is to better understand the inter-relationships among symptoms of depression, illness perceptions, and functional performance in heart failure patients.

STUDY PROCEDURE

During your visit at the Heart Failure Clinic of the Montreal Heart Institute, the nurse principal investigator of this study will invite you to participate in this study, and will explain its purpose. If you decide to participate, she will schedule an interview with you within the next two weeks. During this interview, which will be audio-taped to assure that data is accurate, she will ask you to answer some background questions and fill out 4 questionnaires. The first questionnaire concerns your emotional state, in particular the symptoms of depression, things like difficulty sleeping, loss of interest in your usual daily activities, or increases in your irritability. The second questionnaire in the present study concerns your beliefs about your heart failure: beliefs about the signs and symptoms of heart failure, beliefs about the course and the severity of heart failure, and beliefs about the extent to which heart failure is amenable to control. The two last questionnaires concern your social environment and your ability to perform activities of daily living. This interview, which will take approximately 60 to 90 minutes, will take place at the Heart Failure Clinic, but can also take place in your home, should you prefer this.

At 2 months following this interview, the nurse investigator of this study will contact you by telephone and ask you to answer 2 questionnaires : on the symptoms of depression, and on your ability to perform activities of daily living. This telephone interview will take approximately 30 minutes. As for the baseline interview, the telephone interview will be audio-taped to assure that data is accurate. We will also ask you to provide your consent for access to the information contained in your medical records as well as from the data base of the Régie de l'assurance-maladie du Québec (RAMQ) and of the Ministère de la Santé et des Services sociaux du Quebec.

This study is made in collaboration with the Heart Failure Clinic at the Montreal Heart Institute. If the results of the questionnaire on depression suggests that you have symptoms of depression, this information will be sent to the nurse caring for you at the Heart Failure Clinic. The nurse and the physician at the Heart Failure Clinic will then discuss with you the possibility of referring you for a more complete evaluation by a member of the Psychosomatic Medicine Department of the Montreal Heart Institute.

RISKS AND INCONVENIENCES

Your participation in this study consists of filling out a series of questionnaires. No risks or inconveniences are involved. However, because of the personal nature of the questions, it is possible that you feel the need to talk about it longer. If you feel the need to discuss these feelings more, the investigator of the study will help you to find appropriate resources.

BENEFITS

There are no direct benefits guaranteed to you as a result of your participation in this study. However if the treatment is found to be efficacious, this will lead to an improved treatment for patients who have a condition similar to yours.

VOLUNTARY PARTICIPATION

You are free to participate in this study or withdraw from it at any time on verbal notice. If you decide not to participate or to withdraw, you will receive the standard medical care required by your condition. Whatever your decision, it will not affect the quality of medical care to which you are entitled. Should you decide at any time to withdraw from the study, we will destroy the information you have provided.

If you have any problems or questions regarding this study, you should contact Mrs. Nicole Parent at (514-230-4566).

For information concerning your rights as a research participant, you should contact during working hours Doctor Raymond Martineau, Chairman of the Research Ethics Board, who can be reached through the Research Center Office at (514) 376-3330, extension 3533.

CONFIDENTIALITY

Any information related to this project that concerns you (results of the study questionnaires and medical information) will be kept confidential and only authorized personnel will have access. In some cases, representatives of the Research Ethics Board may review your medical charts.

The information on the study questionnaires, the medical information and audiotaped interview that concerns you will be kept in computer files and will be analyzed with data from other participants, but, neither your name nor any other identification will appear in these files. Your name will be replaced by a numerical identification in all questionnaires and in analyses, and therefore, your anonymity will be strictly preserved. The nurse who will contact you at 2 months for the telephone interview will know your name and your phone number. The list that includes your name will be destroyed once data analysis is completed at 2 months. The information related to the study questionnaires will be kept under lock and key in a secure place for at least 10 years after the end of the study. After this point, this information will be destroyed. However, should you decide to end your participation at any point, we will immediately destroy this information. Results of this study may be published, but your identity will not be revealed.

COMPENSATION

In the event that you experience complications resulting from the study, you will not have to pay for the health services which are not covered by the Quebec Health Insurance Plan.

However, you will not be compensated for any loss of wages that could occur because of an incapacity to work.

In the case of an accident which would cause you any injury, you still have the right to legal action.

Institut de Cardiologie de Montréal
5000 est, rue Bélanger, Montréal, Qué., H1T 1C8 — Tél.: (514) 376-3330

CONSENT FORM
ICM #01-094

PREDIR – PREvalence study of Depression in heart faIluRe patients

Principal investigator and collaborators

Nicole Parent, MSc. PhD candidate, Nancy Frasure-Smith, PhD, Jim Hanley, PhD, François Lespérance, M.D., Margaret Purden, PhD, Anique Ducharme, M.D.

I have asked all the questions I wanted on this research project and have received appropriate answers.

I understand that I remain free to withdraw from the study at any time and this will not prejudice or change my future care.

I have read and understood the content of this form.

I, undersigned, accept to participate in this project.

Patient's signature	Date	Hour
Investigator's signature	Date	Hour

I certify that I have explained the purposes of this project to_____ and he(she) signed the consent form in my presence.

Signature	Date	Hour

01-094-FA-NParent-7mars02.doc
Approved by the Research Ethics Committee of the Montreal Heart Institute at the meeting of January 8, 2002.

N.B. The original of this form must be inserted in the patient's file, a copy placed in the research file and a copy given to the patient.

APPENDIX D Recruitment Log and Clinical Data

ICM — LOG

	Log Date	Appointment date at the clinic	Hospital Number	Name, First name	Sex	Date of birth	Language	Number of past visits at the CHF clinic	Other project, (Name)	Date EF	EF (%)	NYHA class	Scheduled for CABG surgery	Concurrent major illness (cancer, renal failure with dialysis, cardiac transplant investigation)	Cognitive or memory difficulties	Patient refused	Clinic director's approval	Eligibility	Date of psychosocial interview (Baseline)	Date of telephone interview (2 months)	Comments
1					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
2					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
3					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
4					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
5					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
6					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
7					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
8					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
9					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			
10					F M		F E						Y N	Y N	Y N	Y N	Y N	Y N			

CLINICAL DATA ABSTRACTED FROM PATIENT'S MEDICAL CHART

Patient # : ☐☐☐ Date : ☐☐ ☐☐ ☐☐

Day Month Year

Hospital chart #: _____

Etiology of heart failure:

☐ Ischemic heart disease (history of documented MI or angiographically proved coronary arterial obstructive disease)

☐ Valvular disease (postvalve replacement)

☐ Idiopathic (no cause of heart failure apparent)

☐ Other (alcoholic, hypertensive, or myocarditis cardiomyopathy)

Information on pharmacotherapy during the appointment visit:

- Number of prescribed medication: _____ (number)

- Medication received:

Diuretics	_____	Warfarin	_____
Nitrates	_____	Amiodaron	_____
Ace inhibitors	_____	Amlopidine	_____
Digoxin	_____	Others:	_____
B-blockers	_____		_____

APPENDIX E Demographics

PREDIR

Patient ID : ☐☐☐ Patient initials: ☐☐

Date : ☐☐ ☐☐ ☐☐
Jour Mois Année

Demographics

1. What is your date of birth?

☐☐ ☐☐ ☐☐ Age: ☐☐ yrs Sex: ☐
day month year

2. What is your marital status?

(01) Single (Never married)
(02) Living with someone
(03) Married
(04) Separated
(05) Divorced
(06) Widowed

3. How much formal education have you had? (DO NOT READ ALTERNATIVES)

(01) Never attended school
(02) Some grade school
(03) Completed graded school
(04) Some high school
(05) Completed high school
(06) Some university 1st cycle
(07) Completed university 1st cycle
(08) Some university 2nd cycle
(09) Completed university 2nd cycle
Diploma: _____
(10) Other [SPECIFY] _____

4. How many years of schooling is that? _____ years

5. At the present time, does anyone live with you?

   (0) No, I live alone (1) Yes

6. How many close friends or close relatives do you have? That is, people that you
   feel at ease with, can talk to about private matters, or can call on for help.
   (THIS CAN INCLUDE THE SPOUSE)

   _____ close friends or relatives

7. How many of these close friends or close relatives do you see in person or speak
   to on the telephone at least once a month?

   _____ close friends or relatives

APPENDIX F Psychosocial Interview

PREDIR

Patient ID : ☐☐☐ Initial du pt.: ☐☐

Date : ☐☐ ☐☐ ☐☐
Jour Mois Année

CDS

This questionnaire consists of a number of statements about the way you feel ***at present.*** Please listen to each statement and tell me on your answering card how strongly you **agree** or **disagree** with each statement. There are no right or wrong answers.

		Strongly Disagree						**Strongly Agree**
CDS 1	**I have dropped many of my interests and activities...**	1 None dropped	2	3	4	5	6	7 All Dropped
CDS 2	**My concentration is as good as it ever was...**	1 Very poor concentration	2	3	4	5	6	7 Excellent concentration
CDS 3	**I can't be bothered doing anything much...**	1 Keep to do things	2	3	4	5	6	7 Can't be bothered
CDS 4	**I get pleasure from life at present ...**	1 No pleasure	2	3	4	5	6	7 Great pleasure
CDS 5	**I am concerned about the uncertainty of my life...**	1 Not concerned	2	3	4	5	6	7 Very concerned
CDS 6	**I may not recover completely...**	1 Will recover completely	2	3	4	5	6	7 Will not recover
CDS 7	**My sleep is restless and disturbed...**	1 Not restless	2	3	4	5	6	7 Very Restless
CDS 8	**I am not the person I used to be ...**	1 Just the same	2	3	4	5	6	7 Completely different
CDS 9	**I wake up in the early hours of the morning and cannot get back to sleep...**	1 Never wake	2	3	4	5	6	7 Always wake

		Strongly Disagree						Strongly Agree
CDS 10	**I feel like I'm living on borrowed time**	1 Unlimited time	2	3	4	5	6	7 Very much on borrowed time
CDS 11	**Dying is the best solution for me...**	1 No solution	2	3	4	5	6	7 Best solution
CDS 12	**I feel in good spirits...**	1 Very poor spirits	2	3	4	5	6	7 Excellent spirits
CDS 13	**The possibility of sudden death worries me...**	1 Not at all	2	3	4	5	6	7 Very worried
CDS 14	**There is only misery in the future for me...**	1 No misery	2	3	4	5	6	7 Only misery
CDS 15	**My mind is as fast and alert as always...**	1 Slow and inattentive	2	3	4	5	6	7 Very fast and alert
CDS 16	**I get hardly anything done...**	1 Everything done	2	3	4	5	6	7 Nothing done
CDS 17	**My problems are not yet over...**	1 All problems over	2	3	4	5	6	7 Still major problems
CDS 18	**Things which I regret about my life are bothering me...**	1 Absolutely no regrets	2	3	4	5	6	7 Greats regrets
CDS 19	**I gain just as much pleasure from my leisure activities as I used to ...**	1 No pleasure at all	2	3	4	5	6	7 Very great pleasure
CDS 20	**My memory is as good as it always was...**	1 Very poor memory	2	3	4	5	6	7 Excellent memory

		Strongly Disagree						Strongly Agree
CDS 21	**I become tearful more easily than before...**	1 Not at all tearful	2	3	4	5	6	7 Very easily tearful
CDS 22	**I seem to get more easily irritated by others than before...**	1 Never irritated	2	3	4	5	6	7 Very easily irritated
CDS 23	**I feel independent and in control of my life...**	1 No independence	2	3	4	5	6	7 Completely independent
CDS 24	**I lose my temper more easily nowadays...**	1 Never lose temper	2	3	4	5	6	7 Lose it very easily
CDS 25	**I feel frustrated...**	1 Not at all frustrated	2	3	4	5	6	7 Extremely frustrated
CDS 26	**I am concerned about my capacity for sexual activity...**	1 No concern at all	2	3	4	5	6	7 Grave concern

IPQ-R

We are interested in your own personal views of how you now see your heart failure. These are statements other people have made about their heart failure. Please listen to each statement and tell me on your answering card how much you **agree** or **disagree** with each of the following statements about your heart failure. There are no right or wrong answers.

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
IP1	**My heart failure will last a short time**	1	2	3	4	5
IP2	**My heart failure is likely to be permanent rather than temporary**	1	2	3	4	5
IP3	**My heart failure will last for a long time**	1	2	3	4	5
IP4	**My heart failure will past quickly**	1	2	3	4	5
IP5	**I expect to have heart failure for the rest of my life**	1	2	3	4	5
IP6	**My heart failure is a serious condition**	1	2	3	4	5
IP7	**My heart failure has major consequences on my life**	1	2	3	4	5
IP8	**My heart failure is easy to live with**	1	2	3	4	5
IP9	**My heart failure does not have much effect on my life**	1	2	3	4	5
IP10	**My heart failure strongly affects the way others see me**	1	2	3	4	5
IP11	**My heart failure has serious financial consequences**	1	2	3	4	5
IP12	**My heart failure strongly affects the way I see myself as a person**	1	2	3	4	5

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
IP13	My heart failure causes difficulties for those who are close to me	1	2	3	4	5
IP14	My heart failure has a negative impact on me	1	2	3	4	5
IP15	My heart failure is not a problem for me	1	2	3	4	5
IP16	My heart failure doesn't bother me much	1	2	3	4	5
IP17	There is a lot which I can do to control my symptoms	1	2	3	4	5
IP18	What I do can determine whether my heart failure gets better or worse	1	2	3	4	5
IP19	The course of my heart failure is largely dependent on chance or fate	1	2	3	4	5
IP20	The course of my heart failure depends on me	1	2	3	4	5
IP21	Nothing I do will affect my heart failure	1	2	3	4	5
IP22	I have the power to influence my heart failure	1	2	3	4	5
IP23	My actions will have no affect on the outcome of my heart failure	1	2	3	4	5
IP24	My symptoms are beyond my control	1	2	3	4	5
IP25	My symptoms will be around whatever I do	1	2	3	4	5

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
IP26	**My heart failure will improve in time**	1	2	3	4	5
IP27	**There is very little that can be done to improve my heart failure**	1	2	3	4	5
IP28	**My treatment will be effective in helping my heart failure**	1	2	3	4	5
IP29	**The negative effects of my heart failure can be prevented (avoided) by my treatment**	1	2	3	4	5
IP30	**My treatment can control my heart failure**	1	2	3	4	5
IP31	**There is nothing which can help my condition**	1	2	3	4	5
IP32	**The symptoms of my condition are puzzling to me**	1	2	3	4	5
IP33	**My heart failure is a mystery for me**	1	2	3	4	5
IP34	**I don't understand my heart failure**	1	2	3	4	5
IP35	**My heart failure doesn't make any sense to me**	1	2	3	4	5
IP36	**I have a clear picture or understanding of my condition**	1	2	3	4	5

IPQ-R

Listed below are a number of symptoms that you may or may not have experienced since you have heart failure. Please tell me on your answering card whether you have experienced any of these symptoms since you have heart failure, and whether you believe that these symptoms are related to your heart failure.

		I have experienced this symptom *since my heart failure*			**This symptom is related to *my heart failure***	
I1	Pain	Yes	No	→	Yes	No
I2	Sore Throat	Yes	No	→	Yes	No
I3	Nausea	Yes	No	→	Yes	No
I4	Shortness of Breath	Yes	No	→	Yes	No
I5	Weight Change	Yes	No	→	Yes	No
I6	Fatigue	Yes	No	→	Yes	No
I7	Stiff Joints	Yes	No	→	Yes	No
I8	Sore Eyes	Yes	No	→	Yes	No
I9	Wheeziness	Yes	No	→	Yes	No
I10	Headaches	Yes	No	→	Yes	No
I11	Upset Stomach	Yes	No	→	Yes	No
I12	Sleep Difficulties	Yes	No	→	Yes	No
I13	Dizziness	Yes	No	→	Yes	No
I14	Loss of Strength	Yes	No	→	Yes	No
I15	Palpitations	Yes	No	→	Yes	No
I16	Swelling in the Feet or Ankles	Yes	No	→	Yes	No

IPRI

Most relationships with people we feel close to are both helpful and stressful. I will read you various statements that describe some characteristics of personal relationships. Please listen to each statement and tell me on your answering card the statement that best fits your situation. There are no right or wrong answers.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
IPRI 1	I know someone who makes me feel confident in myself	1	2	3	4	5
IPRI 2	Some people I care about share similar views with me	1	2	3	4	5
IPRI 3	There is someone I can turn to for helpful advice about a problem	1	2	3	4	5
IPRI 4	I can talk openly about anything with at least one person I care about	1	2	3	4	5
IPRI 5	There is someone I could go to for anything	1	2	3	4	5
IPRI 6	Some people in my life are too pushy	1	2	3	4	5
IPRI 7	I can count on a friend to make me feel better when I need it	1	2	3	4	5
IPRI 8	There is someone in my life who gets mad if we have different opinions	1	2	3	4	5
IPRI 9	It's safe for me to reveal my weaknesses to someone I know	1	2	3	4	5
IPRI 10	Someone I care about stands by me through good times and bad times	1	2	3	4	5

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
IPRI 11	I have the kind of neighbors who really help out in an emergency	1	2	3	4	5
IPRI 12	There is someone I care about that I can't count on	1	2	3	4	5
IPRI 13	If I need help, all I have to do is ask	1	2	3	4	5
IPRI 14	I have enough opportunity to talk things over with people I care about	1	2	3	4	5

These next statements ask you how often something happens

		Never	Almost Never	Sometimes	Fairly Often	Very Often
IPRI 15	I have enjoyable times with people I care about	1	2	3	4	5
IPRI 16	I spend time doing things for others when I'd really rather not	1	2	3	4	5
IPRI 17	Some people I care about invade my privacy	1	2	3	4	5
IPRI 18	I am embarrassed by what someone I care about does	1	2	3	4	5
IPRI 19	Someone I care about tends to take advantage of me	1	2	3	4	5
IPRI 20	Some people I care about are a burden to me	1	2	3	4	5
IPRI 21	I wish some people I care about were more sensitive to my needs	1	2	3	4	5

		Never	Almost Never	Sometimes	Fairly Often	Very Often
IPRI 22	People I care about make me do things I don't want to do	1	2	3	4	5
IPRI 23	There is tension between me and someone I care about	1	2	3	4	5
IPRI 24	I have trouble pleasing some people I care about	1	2	3	4	5
IPRI 25	At least one person I care about lets me know they believe in me	1	2	3	4	5
IPRI 26	Some people I feel close to expect too much of me	1	2	3	4	5

FPI-SF

This questionnaire asks about how your health usually affects your day-to-day activities.
Please listen to each activity and tell me on your answering card the number that best fits your situation, now:
1) You do this activity easily, with no difficulty at all,
2) You do it with some difficulty,
3) You have much difficulty,
4) You no longer do this activity because of your health,
N/A) You have never done, or choose not to do, an activity for reasons other than health.

		DO			DON'T DO	
Body Care		No Difficulty	Some Difficulty	Much Difficulty	Health Reasons	Choose not to do
FPI1	Dressing & undressing	1	2	3	4	n/a
FPI2	Showering or bathing	1	2	3	4	n/a
FPI3	Caring for your feet	1	2	3	4	n/a
FPI4	Washing your hair	1	2	3	4	n/a
FPI5	Shaving or applying Makeup	1	2	3	4	n/a
Groceries and Meals						
FPI6	Preparing meals/cooking	1	2	3	4	n/a
FPI7	Grocery shopping	1	2	3	4	n/a
FPI8	Carrying groceries	1	2	3	4	n/a
FPI9	Vacuuming or sweeping	1	2	3	4	n/a
FPI 10	Moving furniture, changing sheets, or washing windows	1	2	3	4	n/a
FPI 11	Cleaning bathrooms or washing floors	1	2	3	4	n/a
FPI 12	Mowing the lawn, shoveling snow, raking, or heavy gardening	1	2	3	4	n/a
FPI 13	Going to appointments (such as doctors or dentists)	1	2	3	4	n/a

		DO			DON'T DO	
Physical Exercise		No Difficulty	Some Difficulty	Much Difficulty	Health Reasons	Choose not to do
FPI 14	Regular stretching, moving, or lifting light weights	1	2	3	4	n/a
FPI 15	Walking up and down a flight of stairs	1	2	3	4	n/a
FPI 16	Short walks around the neighborhood or mall	1	2	3	4	n/a
FPI 17	Long fast walks (more than 20 minutes)	1	2	3	4	n/a
FPI 18	Activities such as swimming or bicycling	1	2	3	4	n/a
Recreation Activities for pleasure						
FPI 19	Taking vacations	1	2	3	4	n/a
FPI 20	Indoor activities such as shopping or museums	1	2	3	4	n/a
FPI 21	Going to the movies	1	2	3	4	n/a
FPI 22	Sitting outside	1	2	3	4	n/a
FPI 23	Reading	1	2	3	4	n/a
Spiritual Activities						
FPI 24	Attending religious services	1	2	3	4	n/a
FPI 25	Going to religious ceremonies	1	2	3	4	n/a
FPI 26	Personal reading, meditation, or prayer	1	2	3	4	n/a
FPI 27	Visits from spiritual friends or teachers	1	2	3	4	n/a

		DO with ...			DON'T DO because...	
	Social Interaction	No difficulty	Some difficulty	Much difficulty	Health reasons	Choose Not to
FPI 28	Dinner, cards, bingo or other activity with family and friends in your home	1	2	3	4	n/a
FPI 29	Dinner, cards, bingo or other activity with family and friends in places other than your home	1	2	3	4	n/a
FPI 30	Helping family or friends by going to the store, giving rides, doing repairs or other favors	1	2	3	4	n/a
FPI 31	Helping family and friends in the care of children	1	2	3	4	n/a
FPI 32	Distant or overnight travel to visit others	1	2	3	4	n/a

APPENDIX G Answer Cards

CDS

Strongly Disagree						Strongly Agree
1	2	3	4	5	6	7

1

IPQ-R

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

2

IPQ-R (Symptoms)

I have experienced this symptom since my heart failure			This symptom is related to my heart failure	
Yes	No	→	Yes	No

3

IPRI-SF

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4

IPRI-SF

How often something happens:

Never	**Almost Never**	**Sometimes**	**Faiyly Often**	**Very Often**

5

FPI-SF

DO			**DON'T DO**	
No Difficulty	**Some Difficulty**	**Much Difficulty**	**Health Reasons**	**Choose not to do**

APPENDIX H Modified Charlson Comorbidity Index

Modified Charlson Comorbidity Index

Condition	Score	Definition
Myocardial infarction	1	One or more definite or probable myocardial infarctions; patients have been hospitalized with EKG and/or cardiac enzyme changes
Congestive HF	1	Exertional or paroxysmal nocturnal dyspnea; patients have responded symptomatically (or on physical examination) to digitalis, diuretics, or afterload reducing agents. This does not include patients who are on medication but have had no symptomatic response and no evidence of improvement in physical signs.
Peripheral vascular disease	1	Intermittent claudication, or patients who have undergone a bypass for arterial insufficiency; patients with gangrene or acute arterial insufficiency and those with an untreated thoracic or abdominal aneurysm
Cerebrovascular disease	1	Patients with a history of a cerebrovascular incident with minor or no residual and transient ischemic attacks.
Dementia	1	Chronic cognitive deficits
Chronic pulmonary disease	1	Mild pulmonary disease is dyspnea with moderate activity, without treatment or dyspnea only with attacks. Moderate pulmonary disease is dyspnea with slight activity, with or without treatment and dyspnea with moderate activity despite treatment. Severe pulmonary disease is dyspnea at rest, despite treatment, and may require constant oxygen, may have carbon dioxide retention, or baseline PO_2 <50 torr.
Connective tissue disease	1	SLE, polymyositis, mixed connective tissue disease, polymyalgua rheumatica, and moderate to severe rheumatoid arthritis.

Condition	Score	Definition
Ulcer disease	1	This includes patients who have required treatment for ulcer disease, including patients who have bled from ulcers.
Mild liver disease	1	Cirrhosis without portal hypertension or chronic hepatitis.
Diabetes without end organ damage	1	Diabetes treated with insulin or oral hypoglycemics, and not treated by diet alone.
Hemiplegia	2	Dense hemiplegia whether it occurred as a result of a cerebrovascular accident or other condition.
Moderate or severe renal damage	2	Severe renal disease includes patients on dialysis, patients who had a transplant, and patients with uremia. Moderate renal insufficiency includes patients with a serum creatinine of > 3 mg%
Diabetes with end organ damage	2	This includes patients with retinopathy, neuropathy, or nephropathy
Any tumor, cancer	2	Solid tumors without documented metastases but which were initially treated within the last 5 years
Leukemia	2	Acute and chronic myelogenous leukemia, acute and chronic lymphocytic leukemia, and polycythemia vera.
Lymphoma	2	Hodgkin's, lymphosarcoma, Waldenstrom's macrolobulinemia, myeloma, any other lymphomas.
Moderate or severe liver disease	3	Moderate liver disease is cirrhosis with portal hypertension but without bleeding. Severe liver disease includes cirrhosis, portal hypertension and a history of variceal bleeding.
Metastatic solid tumor	6	Metastatic solid tumors including breast, lung, colon, and other tumors.
AIDS	6	Definite or probable AIDS or AIDS-related complex.

APPENDIX I Sample Size Calculation

R^2 value can be translated into an f^2 value using the following formula:

$$f^2 = \frac{R^2_{Y\,I/DC} - R^2_{Y/DC}}{1-R^2_{Y/DC}}$$

where Y = Dependent variable (depressive symptoms or functional performance, at follow-up)

D = Demographic Covariates

C = Clinical Covariates

I = Illness Perception and Social Support Independent Variables (IVs)

$R^2_{Y\,I/DC} - R^2_{Y/DC}$ = proportion of variance in depressive symptoms or functional performance at follow-up, accounted for uniquely by independent variables (I) over and above what is accounted for by demographic (D) and clinical covariates (I)

$1-R^2_{Y/DC}$ = error variance proportion, which is reduced by demographic and clinical covariates

To find the necessary N for power to be .80, the specifications are:

u = 8 (IVs)
f^2 = .15
v = 120

} yield a value of λ = 15.9 (see Table 9.4.2, p. 453 in {Cohen J. 1977 149 /id})

Solving for N gives:

$$N = \frac{\lambda}{f^2} + w + z = \frac{15.9}{.15} + 6 + 8 = 120$$

where λ = the noncentrality parameter of the noncentral F distribution

w = number of D and C variables (set D and C: 6 variables)

z = number of I variables (set I: 8 variables)

APPENDIX J Additional Variance in Depression and Functional Performance at BASELINE Explained by Illness Perceptions, over and above that Explained by Demographic and Clinical Covariates (n=136)

Variables	Model	R^2	R^2 difference	Sig. F change (p value)	B coefficient	SE Of B
Dependent:	**DEPRESSION** (Baseline)					
Independent:	Demographic and clinical covariates [a]	.15	---	.03*	---	---
	and Identity	.26	.12	<.01**	3.56	.80
	and Timeline	.19	.05	.01*	12.79	4.78
	and Consequences	.39	.25	<.01**	3.94	.56
	and Personal Control	.22	.08	<.01**	-2.49	.70
	and Treatment Control	.30	.15	<.01**	-4.83	.93
	and Coherence	.30	.15	<.01**	-3.15	.61
Dependent:	**FUNCTIONAL PERFORMANCE** (Baseline)					
Independent:	Demographic and clinical covariates [a]	.12	----	.08	---	---
	and Identity	.23	.10	<.01**	-.06	.01
	and Timeline	.14	.02	.08	-.15	.08
	and Consequences	.24	.11	<.01**	-.05	.01
	and Personal Control	.16	.04	.02*	.03	.01
	and Treatment Control	.26	.14	<.01**	.08	.02
	and Coherence	.17	.05	.01**	.03	.01

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a The demographic and clinical covariates in all regression models were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables), and were forced into the regression models as an initial step.

APPENDIX K Additional Variance in Depression and Functional Performance DELTA CHANGE SCORES Explained by Illness Perceptions, over and above that Explained by Demographic and Clinical Covariates (n=136)

Model		R^2	R^2 difference	Sig. F change (p value)	B coefficient	SE Of B
Dependent:	**DEPRESSION** (Delta Change)					
Independent:	Demographic and clinical covariates [a]	.05	---	.80	---	---
	and Identity	.05	.01	.43	-.42	.53
	and Timeline	.05	.00	.63	-1.45	3.00
	and Consequences	.06	.01	.22	-.49	.40
	and Personal Control	.05	.00	.74	-.15	.45
	and Treatment Control	.06	.01	.30	-.65	.63
	and Coherence	.05	.00	.67	.18	.41
Dependent:	**FUNCTIONAL PERFORMANCE** (Delta Change)					
Independent:	Demographic and clinical covariates [a]	.02	----	.99	---	---
	and Identity	.02	.00	.77	.00	.01
	and Timeline	.02	.00	.48	.04	.05
	and Consequences	.03	.01	.32	.01	.01
	and Personal Control	.02	.01	.93	.00	.01
	and Treatment Control	.02	.00	.65	-.00	.01
	and Coherence	.02	.00	.81	.00	.01

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a The demographic and clinical covariates in all regression models were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables), and were forced into the regression models as an initial step.

APPENDIX L Additional Variance in Depression and Functional Performance RESIDUALS CHANGE SCORES Explained by Illness Perceptions, over and above that Explained by Demographic and Clinical Covariates (n=136)

Variables	Model	R^2	R^2 difference	Sig. F change (p value)	B coefficient	SE Of B
Dependent:	**DEPRESSION** (Residual Change)					
Independent:	Demographic and clinical covariates [a]	.07	---	.50	---	---
	and Identity	.07	.00	.82	.12	.50
	and Timeline	.07	.00	.87	.48	2.87
	and Consequences	.07	.00	.78	.11	.38
	and Personal Control	.08	.01	.22	-.53	.43
	and Treatment Control	.11	.04	.02*	-1.38	.59
	and Coherence	.07	.00	.44	-.30	.39
Dependent:	**FUNCTIONAL PERFORMANCE** (Residual Change)					
Independent:	Demographic and clinical covariates [a]	.04	---	.84	---	---
	and Identity	.06	.01	.21	-.01	.01
	and Timeline	.04	.00	.75	.02	.05
	and Consequences	.04	.00	.96	.00	.01
	and Personal Control	.05	.00	.51	.01	.01
	and Treatment Control	.05	.00	.54	.01	.01
	and Coherence	.05	.01	.36	.01	.01

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a The demographic and clinical covariates in all regression models were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables), and were forced into the regression models as an initial step.

Appendix M-1 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Identity, Timeline and Consequences) and Depression at baseline

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **DEPRESSION** (Baseline)						
Independent:						
Identity, Support	.22	---	---	.16	---	---
Identity, Support, Identity * Support	.22	.00	.77	.17	.01	.31
Identity, Support, Demo/Clinical,[a] Identity * Support	.36	.00	.84	.31	.01	.37
Dependent: **DEPRESSION** (Baseline)						
Independent:						
Timeline, Support	.15	---	---	.13	---	---
Timeline, Support, Timeline * Support	.17	.02	.10	.14	.00	.43
Timeline, Support, Demo/Clinical,[a] Timeline * Support	.27	.01	.13	.26	.01	.31
Dependent: **DEPRESSION** (Baseline)						
Independent:						
Consequences, Support	.41	---	---	.36	---	---
Consequences, Support, Consequences * Support	.41	.00	.49	.36	.00	.99
Consequences, Support, Demo/Clinical,[a] Consequences * Support	.45	.00	.51	.41	.00	.98

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX M-2 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Personal and Treatment Control and Coherence) and Depression at BASELINE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value	R^2	R^2 change *(for the interaction term)*	*P* value
Dependent: **DEPRESSION** (Baseline)						
Independent:						
Personal Control, Support	.14	---	---	.13	---	---
Personal Control, Support, Personal Control * Support	.16	.02	.06	.13	.00	.93
Personal Control, Support, Demo/Clinical, Personal Control * Support	.29	.01	.19	.27	.00	.58
Dependent: **DEPRESSION** (Baseline)						
Independent:						
Treatment Control, Support	.17	---	---	.18	---	---
Treatment Control, Support, Treatment Control * Support	.17	.00	.50	.19	.01	.17
Treatment Control, Support, Demo/Clinical, Treatment Control * Support	.33	.00	.59	.35	.01	.15
Dependent: **DEPRESSION** (Baseline)						
Independent:						
Coherence, Support	.21	---	---	.21	---	---
Coherence, Support, Coherence * Support	.22	.01	.17	.21	.00	.95
Coherence, Support, Demo/Clinical, Coherence * Support	.34	.01	.15	.33	.00	.97

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX M-3 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Identity, Timeline and Consequences) and Functional Performance at BASELINE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **FUNCTIONAL PERFORMANCE** (Baseline)						
Independent:						
Identity, Support	.04	---	---	.04	---	---
Identity, Support, Identity * Support	.04	.00	.83	.04	.00	.93
Identity, Support, Demo/Clinical,[a] Identity * Support	.18	.00	.43	.16	.00	.93
Dependent: **FUNCTIONAL PERFORMANCE** (Baseline)						
Independent:						
Timeline, Support	.03	---	---	.03	---	---
Timeline, Support, Timeline * Support	.03	.00	.75	.06	.04	.02*
Timeline, Support, Demo/Clinical,[a] Timeline * Support	.15	.00	.97	.18	.03	.04*
Dependent: **FUNCTIONAL PERFORMANCE** (Baseline)						
Independent:						
Consequences, Support	.06	---	---	.06	---	---
Consequences, Support, Consequences * Support	.07	.01	.21	.07	.01	.35
Consequences, Support, Demo/Clinical,[a] Consequences * Support	.24	.00	.63	.24	.00	.44

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX M-4 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Personal and Treatment Control and Coherence) and Functional Performance at BASELINE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **FUNCTIONAL PERFORMANCE** (Baseline)						
Independent:						
Personal Control, Support	.06	---	---	.07	---	---
Personal Control, Support, Personal Control * Support	.08	.02	.11	.07	.00	.49
Personal Control, Support, Demo/Clinical,[a] Personal Control * Support	.18	.02	.09	.17	.00	.76
Dependent: **FUNCTIONAL PERFORMANCE** (Baseline)						
Independent:						
Treatment Control, Support	.18	---	---	.18	---	---
Treatment Control, Support, Treatment Control * Support	.20	.02	.06	.18	.01	.34
Treatment Control, Support, Demo/Clinical,[a] Treatment Control * Support	.28	.02	.08	.27	.01	.37
Dependent: **FUNCTIONAL PERFORMANCE** (Baseline)						
Independent:						
Coherence, Support	.03	---	---	.03	---	---
Coherence, Support, Coherence * Support	.04	.01	.36	.04	.01	.32
Coherence, Support, Demo/Clinical,[a] Coherence * Support	.18	.00	.60	.18	.01	.38

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX N-1 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Identity, Timeline and Consequences) and Depression DELTA CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **DEPRESSION** (Delta Change)						
Independent:						
Identity, Support	.02	---	---	.01	---	---
Identity, Support, Identity * Support	.05	.03	.05	.02	.00	.53
Identity, Support, Demo/Clinical,[a] Identity * Support	.10	.03	.06	.07	.00	.50
Dependent: **DEPRESSION** (Delta Change)						
Independent:						
Timeline, Support	.02	---	---	.00	---	---
Timeline, Support, Timeline * Support	.03	.02	.13	.01	.00	.54
Timeline, Support, Demo/Clinical,[a] Timeline * Support	.07	.01	.28	.06	.01	.39
Dependent: **DEPRESSION** (Delta Change)						
Independent:						
Consequences, Support	.03	---	---	.01	---	---
Consequences, Support, Consequences * Support	.04	.01	.25	.01	.00	.61
Consequences, Support, Demo/Clinical,[a] Consequences * Support	.08	.01	.39	.06	.00	.91

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX N-2 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Personal and Treatment Control and Coherence) and Depression DELTA CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change	*p* value	R^2	R^2 change	*P* value
		(for the interaction term)			*(for the interaction term)*	
Dependent: **DEPRESSION** (Delta Change)						
Independent:						
Personal Control, Support	.01	---	---	.00	---	---
Personal Control, Support, Personal Control * Support	.06	.05	.01*	.00	.00	.87
Personal Control, Support, Demo/Clinical,[a] Personal Control * Support	.10	.04	.02*	.05	.00	.90
Dependent: **DEPRESSION** (Delta Change)						
Independent:						
Treatment Control, Support	.02	---	---	.01	---	---
Treatment Control, Support, Treatment Control * Support	.04	.02	.14	.02	.00	.60
Treatment Control, Support, Demo/Clinical,[a] Treatment Control * Support	.08	.02	.17	.06	.00	.69
Dependent: **DEPRESSION** (Delta Change)						
Independent:						
Coherence, Support	.02	---	---	.00	---	---
Coherence, Support, Coherence * Support	.02	.00	.57	.02	.01	.19
Coherence, Support, Demo/Clinical,[a] Coherence * Support	.07	.00	.53	.07	.02	.12

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX N-3 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Identity, Timeline and Consequences) and Functional Performance DELTA CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value	R^2	R^2 change *(for the interaction term)*	*P* value
Dependent: **FUNCTIONAL PERFORMANCE** (Delta Change)						
Independent:						
Identity, Support	.03	---	---	.01	---	---
Identity, Support, Identity * Support	.03	.01	.35	.02	.02	.13
Identity, Support, Demo/Clinical,[a] Identity * Support	.05	.00	.46	.05	.02	.12
Dependent: **FUNCTIONAL PERFORMANCE** (Delta Change)						
Independent:						
Timeline, Support	.02	---	---	.00	---	---
Timeline, Support, Timeline * Support	.02	.00	.69	.00	.00	.75
Timeline, Support, Demo/Clinical,[a] Timeline * Support	.04	.00	.61	.03	.00	.77
Dependent: **FUNCTIONAL PERFORMANCE** (Delta Change)						
Independent:						
Consequences, Support	.03	---	---	.01	---	---
Consequences, Support, Consequences * Support	.03	.00	.76	.01	.01	.40
Consequences, Support, Demo/Clinical,[a] Consequences * Support	.05	.00	.74	.04	.01	.36

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX N-4 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Personal and Treatment Control and Coherence) and Functional Performance DELTA CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **FUNCTIONAL PERFORMANCE** (Delta Change)						
Independent:						
Personal Control, Support	.02	---	---	.00	---	---
Personal Control, Support, Personal Control * Support	.08	.07	<.01**	.01	.01	.28
Personal Control, Support, Demo/Clinical,[a] Personal Control * Support	.10	.07	<.01**	.03	.01	.36
Dependent: **FUNCTIONAL PERFORMANCE** (Delta Change)						
Independent:						
Treatment Control, Support	.02	---	---	.00	---	---
Treatment Control, Support, Treatment Control * Support	.02	.00	.45	.01	.01	.24
Treatment Control, Support, Demo/Clinical,[a] Treatment Control* Support	.05	.01	.36	.03	.01	.26
Dependent: **FUNCTIONAL PERFORMANCE** (Delta Change)						
Independent:						
Coherence, Support	.02	---	---	.00	---	---
Coherence, Support, Coherence * Support	.02	.00	.98	.00	.00	.60
Coherence, Support, Demo/Clinical,[a] Coherence * Support	.04	.00	.94	.02	.00	.64

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX O-1 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Identity, Timeline and Consequences) and Depression RESIDUAL CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **DEPRESSION** (Residual Change)						
Independent:						
and Identity, Support	.04	---	---	.01	---	---
and Identity, Support, Identity * Support	.07	.03	.04*	.01	.00	.69
and Identity, Support, Identity * Support, Demo/Clinical [a]	.14	.03	.05	.08	.00	.62
Dependent: **DEPRESSION** (Residual Change)						
Independent:						
and Timeline, Support	.04	---	---	.01	---	---
and Timeline, Support, Timeline * Support	.05	.01	.24	.01	.01	.40
and Timeline, Support, Demo/Clinical,[a] Timeline * Support	.11	.00	.45	.09	.01	.25
Dependent: **DEPRESSION** (Residual Change)						
Independent:						
and Consequences, Support	.04	---	---	.01	---	---
and Consequences, Support, Consequences * Support	.05	.01	.29	.01	.00	.60
and Consequences, Support, Demo/Clinical,[a] Consequences * Support	.11	.00	.44	.08	.00	.90

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX O-2 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Personal and Treatment Control and Coherence) and Depression RESIDUAL CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value	R^2	R^2 change *(for the interaction term)*	*P* value
Dependent: **DEPRESSION** (Residual Change)						
Independent:						
and Personal Control, Support	.05	---	---	.02	---	---
and Personal Control, Support, Personal Control * Support	.08	.04	.03*	.02	.00	.89
and Personal Control, Support, Demo/Clinical,[a] Personal Control * Support	.15	.03	.03*	.09	.00	.79
Dependent: **DEPRESSION** (Residual Change)						
Independent:						
and Treatment Control, Support	.07	---	---	.05	---	---
and Treatment Control, Support, Treatment Control * Support	.09	.01	.17	.06	.01	.37
and Treatment Control, Support, Demo/Clinical,[a] Treatment Control * Support	.15	.01	.17	.12	.00	.44
Dependent: **DEPRESSION** (Residual Change)						
Independent:						
and Coherence, Support	.04	---	---	.01	---	---
and Coherence, Support, Coherence * Support	.04	.00	.79	.03	.01	.17
and Coherence, Support, Demo/Clinical,[a] Coherence * Support	.11	.00	.74	.10	.02	.11

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX O-3 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Identity, Timeline and Consequences) and Functional Performance RESIDUAL CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value	R^2	R^2 change *(for the interaction term)*	*P* value
Dependent: **FUNCTIONAL PERFORMANCE** (Residual Change)						
Independent:						
and Identity, Support	.04	---	---	.02	---	---
and Identity, Support, Identity * Support	.05	.01	.36	.04	.02	.11
and Identity, Support, Demo/Clinical,[a] Identity * Support	.10	.00	.56	.09	.02	.11
Dependent: **FUNCTIONAL PERFORMANCE** (Residual Change)						
Independent:						
and Timeline, Support	.02	---	---	.00	---	---
and Timeline, Support, Timeline * Support	.02	.00	.74	.00	.00	.82
and Timeline, Support, Demo/Clinical,[a] Timeline * Support	.07	.00	.59	.05	.00	.86
Dependent: **FUNCTIONAL PERFORMANCE** (Residual Change)						
Independent:						
and Consequences, Support	.02	---	---	.00	---	---
and Consequences, Support, Consequences * Support	.02	.00	.99	.01	.00	.53
and Consequences, Support, Demo/Clinical,[a] Consequences * Support	.07	.00	.81	.05	.01	.44

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).

APPENDIX O-4 The Moderating Effect of Support and Conflict on the Relationship Between Illness Perception (Personal and Treatment Control and Coherence) and Functional Performance RESIDUAL CHANGE

Model	SUPPORT			CONFLICT		
	R^2	R^2 change *(for the interaction term)*	*p* value *(for the interaction term)*	R^2	R^2 change *(for the interaction term)*	*P* value *(for the interaction term)*
Dependent: **FUNCTIONAL PERFORMANCE** (Residual Change)						
Independent:						
and Personal Control, Support	.03	---	---	.01	---	---
and Personal Control, Support, Personal Cont.* Support	.08	.05	<.01**	.02	.01	.19
and Personal Control, Support, Demo/Clinical,[a] Personal Cont.* Support	.12	.06	<.01**	.06	.01	.30
Dependent: **FUNCTIONAL PERFORMANCE** (Residual Change)						
Independent:						
and Treatment Control, Support	.02	---	---	.01	---	---
and Treatment Control, Support, Treatment Control * Support	.03	.00	.74	.02	.02	.15
and Treatment Control, Support, Demo/Clinical,[a] Treatment Control * Support	.07	.00	.57	.06	.02	.17
Dependent: **FUNCTIONAL PERFORMANCE** (Residual Change)						
Independent:						
and Coherence, Support	.02	---	---	.00	---	---
and Coherence, Support, Coherence * Support	.02	.00	.80	.01	.01	.43
and Coherence, Support, Demo/Clinical,[a] Coherence * Support	.07	.00	.96	.06	.00	.49

** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).

a Demographic and clinical covariates were age (continuous), sex (binary), living alone (binary), formal education (binary), LVEF (4 indicator variables), and Modified Charlson Comorbidity Index (2 indicator variables).