

Predictors of Participation after Stroke:
Influence of Depressive Symptomatology, Gender and Functional Independence

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ABSTRACT

Predictors of Participation after Stroke:
Influence of Depressive Symptomatology, Gender and Functional Independence

Cynthia Dolezsar

Stroke can lead to impairments that restrict participation in social roles. Despite being recognized as an important outcome in rehabilitation, little is known about the predictors of participation. The aim of this study was to estimate the independent contributions of depressive symptomatology, gender and functional independence and the interaction between gender and depressive symptomatology in predicting participation among stroke survivors 6 months post-stroke beyond those afforded by age, co-morbid conditions and a history of depression. Participants ($n=66$) were patients admitted for stroke to a regional hospital, did not have a co-morbid condition which was expected to lead to death and were able to provide consent. Two weeks post-stroke, the following variables were assessed: Depressive symptomatology, as measured by the Stroke-Specific Geriatric Depression Scale; gender; functional independence, as measured by the Barthel Index; age and co-morbid conditions, as measured by a checklist. Three months post-stroke, history of depression was measured by the Structured Clinical Interview for the Diagnosis of DSM-IV Axis I Disorders. Six months post-stroke, participation was measured by the Stroke Impact Scale. Multiple regression analyses generated a significant model ($F(5,60) = 5.74, R^2=37\%, p<0.01$), where greater functional independence predicted greater levels of participation. No other study variables were identified as independent predictors. These results are in line with other evidence that functional limitation is a risk factor for restricted participation. Screening and targeting functional independence during hospitalization for stroke will allow for rehabilitation

programs to identify those at risk for restricted participation once stroke survivors return to the community.

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Predictors of Participation after Stroke:
Influence of Depressive Symptomatology, Gender and Functional Independence

Introduction

Stroke is the most common of all serious neurological disorders, accounting for half of all acute hospitalizations for neurological disease (Hachinski & Norris, 1985). It is the third leading cause of death in developed countries (Sarti, Rastenyte, Cepaitis, & Tuomilehto, 2000) and results in over 5.54 million deaths per year worldwide (WHO, 2000). The World Health Organization (WHO) (1998) defines stroke or cerebrovascular accident as, "a set of rapidly developing clinical signs of focal (or global) disturbance in cerebral functional independence, with symptoms lasting more than 24 hours (unless interrupted by surgery or death), with no apparent nonvascular cause."

Stroke, whether of the ischemic or hemorrhagic variety, is caused by the interruption of blood flow to the brain. Ischemic strokes are caused by a blood clot in the brain and account for 67-81% of stroke incidents. Hemorrhagic strokes are caused by the rupture of blood vessels in the brain. Such strokes present themselves in one of two ways: intracerebral hemorrhage, which accounts for 7-20% of all strokes; and subarachnoid hemorrhage, which accounts for 1-7% of all strokes. Intracerebral hemorrhage occurs when an artery in the brain ruptures, whereas subarachnoid hemorrhage is characterized by uncontrolled bleeding in the subarachnoid space in the brain (Feigin, Lawes, Bennett, & Anderson, 2003). While the source of bleeding is unknown in many subarachnoid hemorrhages, the majority are the consequence of a ruptured aneurysm in a major artery in the brain (Rinkel, van Gijn, & Wijndicks, 1993). In an estimated 2-15% of all strokes, however, the type of stroke is undetermined (Feigin et al., 2003).

Risk factors for stroke include advanced age, hypertension, previous stroke, transient ischemic attack, diabetes, high cholesterol, cigarette smoking and atrial fibrillation (Romero, Morris, & Pikula, 2008). A review of population-based studies conducted by Feigin et al. (2003) has reported a trend towards either a stabilization or an increase in the incidence of stroke since the 1970s, particularly in the elderly. More than half of all strokes occur in individuals over the age of 75, with an average of 70 years of age in men and 75 years of age in women (Feigin et al., 2003). Given our ageing population, the incidence of stroke is likely to be on the rise (Feigin et al., 2003). Conversely, the mortality rates for stroke have gradually decreased in the last 4 decades, particularly in North America, Western Europe and Japan (Sarti et al., 2000; Murray & Lopez, 1997; Foulkes, Wolf, Price, Mohr, & Hier, 1988; Caro, Huybrechts, & Duchesne, 2000; Bonita, Stewart, & Beaglehole, 1990; WHO, 1998; WHO, 2000). The decline in mortality from stroke since the 1970s may be attributed to better control of hypertension (Robinson, 2003). The case-fatality within 1 month of having had a stroke is currently estimated to be around 23% (42% for intracerebral hemorrhage, 32% for subarachnoid hemorrhage and 16% for ischemic stroke) (Feigin et al., 2003). The stabilization or increase in stroke incidence, when combined with a decrease in mortality rates, will likely result in a greater number of stroke survivors, many of whom are living with the consequences of stroke.

Consequence of Stroke

Stroke is one of the leading causes of long-term disability in Canada (Heart and Stroke Foundation of Canada, 2007) and an estimated 50,000 Canadians experience a stroke every year (Heart and Stroke Foundation of Canada, 2007). By the year 2020,

stroke and coronary-artery disease together are expected to be the leading causes of lost healthy years of life (WHO, 2000). Overall, stroke health care, including those of initial hospitalization, rehabilitation and nursing home, costs the Canadian health care system \$2.7 billion each year (Heart and Stroke Foundation of Canada, 2007). Stroke survivors frequently experience physical, cognitive and emotional consequences as a result of a stroke. These limitations may include paralysis or decreases in mobility, memory deficits, language impairments, vision problems, anxiety, irritability, apathy and depression (Dombovy, Basford, Whisnant, & Bergstralh, 1987).

Although both inpatient (Langhorne, 2002; Legg, 2004) and outpatient rehabilitation (Legg, 2004; Lincoln, Walker, Dixon, & Knights, 2004) are effective in improving functional dependence resulting from stroke, a significant proportion of individuals will be unable to resume their previous pursuits and social roles, such as that of a spouse or grandparent (Radomski, 1995). Often, there is little emphasis on the part of rehabilitation professionals on enabling the patient to regain former pursuits and roles that were previously valued by the patient (Tyson & Turner, 2000; Hafsreinsdottir & Grypndonck, 1997). Rather there is a focus on improving functional abilities in activities of daily living (ADL) (i.e. bathing, dressing and walking), such that the patient is able to return to the community in a more autonomous state (Radomski, 1995). Commonly reported in the rehabilitation literature is that stroke survivors, upon discharge from rehabilitation, not only expressed feeling ill-equipped for life in the community, but also experience difficulty participating in life in ways they find fulfilling (Wiles, Ashburn, Payne, & Murphy, 2002; Wiles, Ashburn, Payne, & Murphy, 2004; Stone, 2005; Hill, 1997; Burton, 2000; Bhogal, Teasell, Foley, & Speechley, 2003). For example, Mayo,

Wood-Dauphinee, Côté, Durcam and Carleton (2002) conducted telephone interviews 6 months following stroke and found that 53% of a sample of 434 participants reported restrictions in meaningful social, recreational and occupational activities. In a sample of 90 stroke survivors surveyed 1 year following stroke, Carod-Artal (2002) found that 15% of participants did not engage in outdoor mobility and social outings, 63% did not pursue an interest and 92% were not employed. Similarly, Hartman-Maeir, Soroker, Ring, Katz and Avni (2007) found that 56 participants reported having given up 40% of their leisure activities that did not demand high physical strength or endurance, 74% of their leisure activities that did demand high physical strength or endurance and 49% of their social leisure activities, as compared to before their stroke at a 1-year follow-up. Katz (2003) observed that the decline in engagement was found to be significantly more pronounced in stroke survivors than the decline occurring with age in a sample of healthy individuals, emphasizing the severe and long-term impact of stroke.

Given the focus during the last 2 decades on understanding the broader consequences beyond those related to functional autonomy, several models of rehabilitation have been developed that incorporate the notion of operating in society and the pursuit of meaningful activities. These conceptual frameworks refer to such engagement as “participation”. One such model, the Disability Creation Process (DCP) has operationalized *participation* as “life habits” which include “daily activities and social roles that ensure the survival and development of a person in society through his or her life”. In short, participation goes beyond basic daily needs (feeding, personal care and mobility) and includes social roles, such as interpersonal relationships and leisure activities (Desrosiers, Noreau, & Rochette, 2004). In the DCP model, personal factors

(such as abilities, gender or age) interact with environmental factors (such as social support) to inhibit or facilitate participation. The International Classification of Function, Disability and Health (ICF) is another model based on WHO's (2000) framework for measuring health and disability at both individual and population levels. The ICF defines *participation* as a person's involvement in a life situation, such as community, social and civic life. Participation is conceived as the result of a complex interaction among factors such as the individual's disease; body structures and functions; activity performance (defined as the execution of a task or action); personal characteristics; and environmental factors (a person's social and physical circumstances). Both the DCP and ICF models go beyond the effects of traditional basic functional outcomes to address broader health outcomes that are of great value to patients (Cardol, De Jong, & Ward, 2002; Carr, 1999; Coster, Haley, Ludlow, Andres, & Ni, 2004). As such, participation is increasingly recognized as one of the final outcomes to consider in rehabilitation.

Impact of Restrictions in Participation

The prognostic significance of restrictions in participation has been examined in several populations, including individuals with physical disabilities and occupational therapy patients. Participation has been found to be related to quality of life (QOL) in individuals with disability, although the literature reports different degrees of association between participation and QOL. Levasseur, Desrosiers and Noreau (2004) and Kirchman (1986) found participation to have a weak association with QOL. Other research findings have shown the relation between participation and QOL to be stronger (Elliott, 1987; Lau, 1998; Maguire, 1983; Prince, 1997; Patrick, 2000; Smith, 1986). Participation has also been found to be an independent predictor of QOL in several other studies (Maguire,

1983; Osberg, 1987; Koplas, 1999). Although the strength of the association between participation and QOL is yet to be well understood, participation is considered a necessary component in enhancing one's QOL (National Institutes of Health, 1993).

Restrictions in participation have also been found to be related to life satisfaction. Hartman-Maeir, Soroker, Ring, Katz and Avni (2007) examined the relation between participation and life satisfaction in 56 community-dwelling stroke survivors (mean age of 57.7 years) 1 year after stroke. They found that participation predicted life satisfaction beyond the effects accounted for by age, gender and depression. A study by Sveen et al. (2004) found a significant relationship between leisure activities and life satisfaction in 64 Norwegian participants 6 months post-stroke.

Determinants of Participation

Although restriction in participation in stroke survivors is recognized, the factors that relate to participation are yet to be well understood. Relatively few studies have examined the predictive factors related to participation. In the studies that have, several factors have been identified as potential predictors of participation, including: Psychological variables, such as depression, hope and acceptance of stroke; and physical variables such as walking ability, motor coordination and functional independence. Presented below (see Table 1) is an overview of studies that have examined factors associated with participation. Although there is a lack of consensus on the definition of participation, the following studies considered participation as involvement in meaningful pursuits and roles.

Table 1

Descriptions of Studies Examining Predictors of Participation

Study	N	Setting	Time	Independent predictors	Time	Factors not predicting participation
			predictors		participation	
Chau et al. (2009)	188	Rehabilitation	1 yr post- rehabilitation	Function, depressive symptoms, self-esteem, gender, age, living arrangements	1 yr post- rehabilitation	Social support satisfaction
Desrosiers et al. (2008)	78	Hospital	1 mo	Acceptance of stroke, stroke severity, age, co- morbid conditions	4 mo	Walking, motor impairment of affected limbs, cognition, depressive symptoms
Desrosiers et al. (2008)	95	Rehabilitation	5 mo	Walking, depressive symptoms, cognition	8 mo	Motor impairment of affected limbs, acceptance of stroke, stroke severity, age, co-morbid conditions

Beckley (2007)	95	Rehabilitation	3-6 mo post- rehabilitation	Quantity and quality of social support, function	3-6 mo post- rehabilitation	Income, age, race, gender
Desrosiers et al. (2006)	102	Rehabilitation	4 mo	Depressive symptoms, lower extremity coordination, duration of rehabilitation, balance, age, co-morbid conditions	10 mo	Sensorimotor function, upper extremity disability and coordination, walking, cognition, communication, incontinence, motivation, education, stroke characteristics, occupation, living environment, length of time between stroke and rehabilitation
Desrosiers et al. (2006)	66	Rehabilitation	4 mo	Co-morbid conditions, age, lower and upper extremity coordination, depressive symptoms	2-4 yr	Sensorimotor function, upper extremity disability, walking, balance, cognition, communication, incontinence, motivation, education, stroke characteristics, occupation, living environment, length of time

between stroke and rehabilitation,

duration of rehabilitation

Hopeful thinking, depressive

symptoms

3 mo

Memory, physical

capacities (strength, ADL,

mobility, hand function)

< 1 mo

Hospital

Gum et al. 110

(2006)

Gender

5 yr

Function, depressive

5 yr

Rehabilitation

D'Alisa et 73

symptoms, anxiety

al. (2005)

symptoms, age, stroke

severity

Gender, facilitators to physical,

6 mo post

Cognition, perception,

Post

Rehabilitation

Rochette, 51

social environment

rehabilitation

depression, sensorimotor

rehabilitation

et al.

function, communication,

(2001)

co-morbid conditions, age,

barriers to physical, social

environment

Harwood et al. (1997)	95 Hospital	1 yr	Depressive symptoms, ADL	1 yr	Age, function, gender, stroke severity
Harwood et al. (1997)	102 Hospital	1 yr	Stroke severity, ADL	2-3 yr	Age, gender, function, depressive symptoms

Several studies examined participation in a sample recruited from inpatient rehabilitation centers. For instance, Chau, Thompson, Twinn, Chang and Woo (2009) examined the determinants of participation in 188 stroke survivors 12 months following discharge from rehabilitation. Function, depressive symptomatology, age, self-esteem, gender and living arrangement were identified as independent predictors of participation. In another study, Desrosiers et al. (2008) investigated the determinants of participation in a sample of 95 stroke survivors recruited from an rehabilitation center. Findings suggest that walking, depressive symptoms and cognitive abilities 5 month following stroke predict participation at 11 months following stroke. Beckley (2007) examined the relation between social support and participation. Both quantity and quality of social support as well as functional independence were found to predict participation in a sample of 95 stroke survivors recruited 3 to 6 months after discharge from inpatient rehabilitation. In another study, Desrosiers and her colleagues (2006) investigated the predictors of participation at 10 months post-stroke in a sample of 102 participants. Depressive symptoms, lower extremity coordination, duration of rehabilitation, balance, age and co-morbid conditions assessed at discharge from inpatient rehabilitation were found to predict participation. Participation at 2 and 4 years following stroke was also examined within the same sample. Desrosiers et al. (2006) found that co-morbid conditions, age, lower and upper extremity coordination, depressive symptoms assessed at discharge from inpatient rehabilitation predicted participation at 2 and 4 years following stroke. In another study by D'Alisa and colleagues (2005), functional independence, depressive and anxious symptomatology, age and stroke severity were found to independently predict participation (mean of 5 years following stroke) in 73 individuals. Finally, Rochette et al.

(2001) found cognition, perception, depression, communication, sensorimotor function, co-morbid conditions, age and barriers to physical and social environment assessed after rehabilitation predicted participation 6 months after the termination of rehabilitation.

Other studies did not limit their sample to participants admitted to inpatient rehabilitation and examined the determinants of participation in individuals recruited from acute care facilities. In the same paper, Desrosiers et al (2008) also investigated the determinants of participation in a sample recruited from a hospital. Findings suggest that acceptance of stroke, stroke severity, age and co-morbid conditions measured at 1 month following stroke predicted participation at 8 months following stroke in a sample of 78 stroke survivors. In a study of 110 stroke patients, Gum, Snyder and Duncan (2006) found that memory and physical capacities measured less than 1 month following stroke independently predicted participation at 3 months post-stroke. Harwood et al. (1997) studied the determinants of participation at 1 and 2-3 years following stroke in a sample of 102 participants. Depressive symptoms and ADL measured at 1 year post-stroke predicted participation at 2 to 3 years post-stroke. Stroke severity and ADL measured at 1 year post-stroke were found to predict participation at 2 to 3 years following stroke.

In sum, several studies have recently investigated the determinants of participation using either rehabilitation or hospital samples. Given that the factors associated with participation have not received much attention, most of the above-mentioned studies examined a large array of variables. The majority of the research investigating the determinants of participation should thus be considered as exploratory. Nonetheless, the factors most commonly identified as predictors of participation were indices of physical limitation or functional independence and depressive

symptomatology. Only two studies assessed the predictors within the first month since the stroke onset. Other studies assessed the predictor variables from anywhere between 4 months and 5 years after stroke. Finally, the above-mentioned studies examined participation over a range of time since the stroke incident, ranging from as early as 3 months post-stroke to as late as 5 years post-stroke.

Objectives

A clearer understanding of the factors associated with participation following stroke is essential for an understanding of the broader impact of stroke. Moreover, an understanding of the determinants of participation would benefit clinical outcomes greatly by guiding both the research and the delivery of rehabilitation intervention programs. This study aimed to estimate both (i) the independent contributions to participation of depressive symptomatology, gender and functional independence and (ii) the interaction between gender and depressive symptomatology in predicting participation among stroke survivors 6 months post-stroke, beyond the effects of age, co-morbid conditions and a history of depression.

Literature Review

From the available studies, factors that were associated more consistently with participation following a stroke included physical limitation and functional independence. Desrosiers et al. (2008), Desrosiers et al. (2006) and Gum, Snyder and Duncan (2006) identified as independent predictors of participation, indices of physical limitations such as walking, coordination and balance. Although such indices can be considered proxies for functional independence, only four studies specifically examined functional independence as a factor associated with participation. Chau, Thompson, Twinn, Chang

and Woo (2009) identified functional independence as a predictor of participation, both variables having been measured at 1 year following stroke. Beckley (2007) identified functional independence, measured at 3-6 months following rehabilitation from stroke, as a determinant of participation during that same time frame. D'Alisa, Baudo, Mauro and Miscio (2005) identified functional independence measured at 5 years post-stroke to be a determinant of participation during that same time frame. Harwood (1997) failed to identify functional independence measured at 1 year as a determinant of participation at 1 year or at 2 to 3 years after stroke. In these three studies, functional independence was measured relatively late following the stroke incident, that is, between 3 to 12 months after rehabilitation and was in all cases measured concurrently with participation. The current study sought to examine whether functional independence immediately following stroke predicts participation at 6 months post-stroke.

Early identification of stroke survivors at risk for restricted participation is essential. Should functional independence, measured within 2 weeks of having experience a stroke, predict subsequent participation, then increased attention can be paid to the assessment of functional independence when attempting to identify those at risk for restricted participation. Those at risk can benefit from rehabilitation that targets their functional limitation, since rehabilitation interventions have been shown to be effective in improving function (Dombovy et al., 1987). It is particularly important to identify those at risk early on, given the course of functional recovery following stroke, namely, that after an early phase of progressive improvement, stroke survivors typically reach a plateau in functional recovery. Although recovery may continue over a long period of time in some stroke survivors, most improvement takes place in the first three months

following stroke. Only minor measurable improvements occur after 6 months following onset (Kelly-Hayes et al., 1989). Since most gains in function are made in the first three months following stroke, it is important to identify those at risk soon after the stroke incident, so that they may benefit from rehabilitation intervention that would prevent restricted participation on their return to the community.

Depressive symptomatology has also been identified as a predictor of participation in several studies (Desrosiers et al., 2008; Desrosiers et al., 2006; D'Alisa, Baudo, Mauro, & Miscio, 2005; Rochette, 2001). Other studies, however, have not confirmed the independent association between depressive symptomatology and participation (Desrosiers et al., 2008, Gum, Snyder & Duncan, 2006, Harwood, 1997) in a sample recruited from a hospital setting. Given the inconsistency in these findings, the current study sought to re-examine the association between depressive symptomatology and participation. Furthermore, to ascertain the relation between depressive symptomatology and participation, the current study used a measure of depression specific to stroke. In contrast, previous studies used more standard assessment tools that were not tailored specifically for use in a stroke sample to assess depressive symptoms. These more standard depression rating scales may not be suitable for a sample of individuals with stroke as they may contain items that relate to the underlying neurological incident rather than to the depression itself. Scores using these standard scales may therefore be confounded either by neurologic symptoms that result from the stroke or by nonspecific distress, rather than depression (Schramke, Stowe, Ratcliff, Goldstein, & Condray, 1998). Although such standard depression measures may not account for the inconsistent findings concerning depressive symptomatology as a

predictor of participation, their use may result in inflated depression scores. As such, the current study sought to re-examine the association between depressive symptomatology and participation, estimating their independent relation by using the Stroke-Specific Geriatric Depression Scale (SS-GDS), a scale that excludes items that may relate to the neurological damage resulting from stroke rather than to depressive mood.

The association between gender and participation has been examined in stroke populations. Gender was not identified as a predictor of participation in several studies (Beckett et al., 1996; D'Alisa et al., 2005; Hartman-Maeir, Soroker, Ring, Katz, & Avni, 2007; Harwood, 1997). Chau, Thompson, Twinn, Chang and Woo (2009), however, in a sample of Chinese stroke survivors, found female gender to independently predict restrictions in participation. Although Harwood (Harwood, 1997) did not identify gender as independently associated with participation, gender differences were reported with respect to restrictions in participation. Women were found to be more restricted in their participation than men at 1 year post-stroke. Gender differences in participation were also found in other populations comparable to a stroke sample. For instance, Wachelder (2009), in a sample of 63 participants, reported that men had lower levels of participation as compared to women 1-6 years after having experienced a cardiac arrest. Wilkie, Thomas, Mottram, Peat and Croft (2008), in a sample of 6965 community-dwelling adults aged 50 years and over, reported that the incidence of restricted participation at baseline and at 3-year follow-up was greater for women than for men. Furthermore, restrictions in participation between baseline and follow-up were found to be more persistent in women than in men. Similarly, Wilkie, Thomas, Mottram, Peat and Croft (2006), in a sample of community-dwelling adults over the age of 50, found that the

prevalence of restriction in participation was significantly greater for women than for men. In another study, Hsu (2005), examined gender disparities in Taiwan, in a sample of 4049 individuals aged 60 and over, where women showed lower levels of participation. By contrast, Harwood, Prince, Mann and Ebrahim (1998), in a sample of 654 community-dwelling individuals over the age of 65 years, reported similar levels of participation between men and women, after adjusting for age. Given the reported gender differences in stroke, in cardiovascular and in older adult populations, the current study sought to re-examine the relation between gender and participation, as restrictions in participation following stroke may be experienced differently in men and women.

Furthermore, the effect of gender on participation may also be influenced by a hypothesized gender difference in post-stroke depression. Unipolar depressive disorders in many populations occur more frequently in women than in men (Paradiso & Robinson, 1998). Studies examining gender differences in depression among stroke survivors specifically have yielded inconsistent results. Paradiso and Robinson (1998) found that a major depressive disorder identified 2 weeks after stroke was twice as frequent among women as among men in a sample of 301 participants. Similarly Anderson, Vestergaard, Riis and Lauritzen (1994) reported a gender difference in a sample of 285 stroke survivors, where women expressed more depressive symptoms as compared to men 1 year post-stroke. In a sample of 180 participants, Angeleri, Angeleri, Foschi, Giaquinto and Nolfi (1993) reported that women scored worse on a depressive screening measure as compared to men 1 year or more post-stroke. Morris, Robinson, Raphael and Bishop (1991) found that depressive disorders were more frequently identified in men than in women three months following stroke, in a sample of 76 stroke patients. Conversely,

Burvill et al. (1995) did not find gender differences in the frequency of depressive disorders at the time of stroke in a sample of 248 survivors. Similarly, Sharpe et al. (1994) did not find gender-based disparities in the frequency of depressive disorders identified 31-64 months following stroke in a sample of 60 participants, nor did Astrom, Adolfsson and Asplund (1993), who reported that depressive disorders were not identified more frequently in men than in women ($n=98$). Dam, Pedersen and Ahlgren (1989) also failed to identify gender differences in depressive symptomatology in a sample of 92 stroke survivors (8-1,280 days post-stroke). Lastly, gender differences in depressive symptomatology were not reported by Wade, Legh-Smith and Hewer (1987).

The effect of depression on functional impairment has been found to differ according to gender. Morris, Robinson, Raphael and Bishop (1991) found that among men, depression was associated with greater physical disability than was the case for women in a sample of stroke survivors. They also found a greater frequency of depression among men with greater physical disability than among men with less severe impairment. In a study by Paradiso et al. (1998), men also appeared to be more susceptible to developing a depressive response to physical and social impairment. This association between depression and impairment seen in men has also been reported in other populations, notably among those who have experienced myocardial infarction (Schleifer & Ari-Hinson, 1989; Travella, Forrester, Schultz, & Robinson, 1994). Likewise, poor social functioning was the clinical variable that was most consistently associated with major depression at 1-year follow-up in a sample composed predominantly of men with traumatic brain injury (Fedoroff et al., 1992; Jorge, Robinson, & Arndt, 1993).

As demonstrated, gender differences in depression have been reported in stroke samples or other comparable populations. Gender differences have also been found to affect participation. Furthermore, an interaction between gender and depression on physical impairment has also been reported. Given this interaction and the relationship between the association between impairment and participation, it is possible that an interaction involving gender, depression and participation also exists.

Although the literature that examined the determinants of post-stroke participation was scarce, the factors that were more consistently associated with it included either function or indices of physical limitation and depression. The current study provided a closer examination of the relations among functional independence, depressive symptomatology and participation. If the relation between function and participation is stronger than that which holds between depression and participation, then it might be argued that interventions aimed at improving function would optimize participation, which is a desired outcome in the consequence of stroke. Although gender differences in participation have been reported, gender has not typically been identified as an independent predictor of participation. Unlike function and depression, gender is not a modifiable variable amenable to interventions. Clearly, a better understanding of the influence of gender on participation would provide information that would help guide rehabilitation professionals.

The current study sought to examine the independent contributions of functional independence, depressive symptomatology and gender on participation, as well as how the interaction between depressive symptomatology and gender affects participation, beyond the effects of age, co-morbid conditions and a history of depression. Age was

selected as a potential confounder since it has frequently been identified as a predictor of participation (Desrosiers et al., 2008; Desrosiers et al., 2006; D'Alisa et al., 2005; Rochette, 2001; Chau, Thompson, Twinn, Chang, & Woo, 2009). Similarly, co-morbidity has been identified as a determinant of participation (Desrosiers et al., 2008; Desrosiers et al., 2006; Rochette, 2001) and as such, was considered a potential confounder in the current study. However, depression prior to stroke has yet to be examined in relation to participation. As previously mentioned, depression has been associated with restrictions in participation. Accordingly, a stressful life event may result in decreased participation. It is therefore possible that in individuals having a history of depressive disorders, a stressful life event, such as that of a stroke, may bring about a decrease in participation, thereby mimicking prior learned responses. The current study therefore considered a history of depression to be a potential confounder.

The majority of the previous studies relating to participation have limited their samples to stroke survivors admitted to inpatient rehabilitation. Generally, individuals sent to inpatient rehabilitation have greater functional dependence following stroke, as compared to individuals sent home or to outpatient rehabilitation. Selecting participants from an inpatient program limits the external validity of the findings, given that stroke survivors attending inpatient rehabilitation are not necessarily representative of all stroke survivors who have experienced restrictions in participation. The current study examined participation in a sample of individuals admitted to an acute care facility, regardless of their discharge destination. These findings may therefore be more generalizable to a general stroke population.

Furthermore, the current study distinguishes itself from the other studies cited above in that it used a measure of participation that was designed specifically for a stroke population. The studies previously described used generic assessment tools that have been validated on the populations with chronic disabling condition, rather than specifically on stroke populations. The current study used the Participation Domain of the Stroke Impact Scale has been found to be a reliable and valid measure of participation. also, it has been specifically designed for use with stroke patients (Duncan et al., 1999). In addition, the measures used in this study to assess functional independence and depressive symptomatology were also designed specifically for stroke survivors.

Hypotheses

Four main hypotheses were formulated: (1) greater number of depressive symptoms assessed at 2 weeks post-stroke will independently predict greater restrictions in participation 6 months post-stroke; (2) being a man will independently predict greater restrictions in participation 6 months post-stroke; (3) lower levels of functional independence assessed at 2 weeks post-stroke will independently predict greater restrictions in participation 6 months post-stroke; and (4) the gender and depressive symptomatology interaction will predict participation 6 months post-stroke. Men, as compared to women, will exhibit greater decreases in participation as their depressive symptoms increase.

An assessment of restricted participation should take place when stroke survivors have had the opportunity to return to their normal living environments and resume their engagement in meaningful pursuits and roles. Studies by Mayo et al. (2002), Carod-Artal (2002) and Hartman-Maeir, Soroker, Ring, Katz and Avni (2007) reported restrictions in

participation 6 to 12 months following stroke. Thus, 6 months following stroke was considered an appropriate time to assess participation for the current study.

Method

Study Design

The current study was embedded in an ongoing prospective study which aims to examine the dynamic pattern of depressive symptoms occurring in the year following a stroke. The prospective study includes: (i) in-person comprehensive assessments measuring depressive symptoms, disability, precipitating events that may modify depression or disability, cognitive status, social support and medication and (ii) telephone interviews measuring depression, disability and cognitive status. The current study was a prospective study, evaluating the impact of depressive symptomatology, gender and functional independence and the interaction between gender and depressive symptomatology on participation 6 months post-stroke.

Participants

The study sample included persons with a verified stroke, based on clinical and computed tomography (CT) or magnetic resonance imaging (MRI) criteria, who were admitted to one of the adult acute care facilities of the McGill University Health Center (Royal Victoria Hospital, Montreal General Hospital or Montreal Neurological Institute). Screening information was obtained through inspection of hospital medical charts. Those eligible were patients who were to be, or had been, discharged back to the community, whether to their homes, to private residential settings or to inpatient rehabilitation centers within the greater Montreal area. The patients' discharge plans were obtained from the hospital medical charts. Eligible participants spoke either English or French.

Excluded from this sample were persons with a co-morbid condition which was expected to lead to death within a year following discharge (such as organ failure or malignancy). Also excluded were those admitted to acute care facilities ten days or more following a stroke. Information pertaining to exclusion criteria was obtained through inspection of hospital medical charts. To avoid biased assessments and ensure that participants were able to provide informed consent, patients with severe cognitive impairment according to the Brief Version Mini-Mental State Examination ((MMSE) < 14/18), were also excluded (see Appendix A).

Seven hundred and thirteen (100%) individuals admitted for stroke were screened. From these, 507 (71%) were excluded from the study. The reasons for exclusions are presented in Table 2. Twenty eight (4%) were not approached, owing to the lack of availability of the study coordinator. Of those who were approached, 67 (9%) refused to participate. Common reasons expressed for refusal to participate included 'too much to cope with at the present time' (28%), 'feeling too well' (15%), 'too long a commitment' (11%) and 'too depressed' (9%). One hundred and eleven agreed to participate and were included in the final analyses. The final accrual rate was 16% (62% of eligible patients).

To investigate the generalizability of data of the selected sample, participants were compared to eligible stroke survivors who refused to participate. The characteristics of the stroke survivors who were invited to participate are shown in Table 3. Chi-square (χ^2) and *t*-tests were used to contrast stroke survivors who participated and those who refused. There were no differences between groups with respect to socio-demographic information (age, gender), stroke severity as measured by the Canadian Neurological

Table 2

Reasons for Exclusions

Justification	<i>n</i> excluded
Severe cognitive impairment (MMSE<14)	126
Out of study area	110
Deceased	73
Severe illness	46
Language barrier	44
Transient ischemic attack	39
Not a stroke	37
Admitted more than 10 days after stroke	14
Brain tumour or trauma	10
Subarachnoid haemorrhage	4
Subdural hematoma	3
Stroke unconfirmed after 10 days	1
Total	507

Table 3

Characteristics of 178 Stroke Survivors Invited to Participate in the Study

	Patients refusing to participate (<i>n</i> = 67)	Participants (<i>n</i> = 111)
Age	72	71
Gender, % male	55	59
Acute care length of stay, days	16	18
Stroke severity, CNS	9	8
Functional independence, Barthel Index	62	68

Note. CNS = Canadian Neurological Scale.

**p* < .05.

Scale (CNS), degree of functional independence as measured by the Barthel Index, or length of stay in hospital (number of days between admission to acute care facility and discharge) (all $ps > .05$).

Materials

There are three types of variables under consideration in the current study: (i) the outcome variable – participation; (ii) exposure variables – depressive symptomatology, gender and functional independence; and (iii) potential confounders – age, co-morbid conditions and a history of depression. Stroke characteristics and socio-demographic information were also obtained.

All measures employed in the study have been used in stroke populations or comparable populations, such as aging individuals, or in those with chronic health conditions. Validated English and French versions of measures were available.

Outcome variable

Participation was assessed at 6 months post-stroke by the Participation Domain of the Stroke Impact Scale (SIS) Version 3.0 (see Appendix B). The SIS is an interviewer-administered measure that evaluates the impact of stroke in multiple domains, including participation. The SIS was developed as a comprehensive measure of health outcomes post-stroke to cover several aspects of a person's life. The SIS incorporates the WHO (2000) model of disability. The SIS consists of eight domains that can be scored individually and be used as a unique measure. Each dimension is assessed independently and represents a distinct aspect of stroke recovery (Duncan, Bode, Lai, & Perera, 2003). The Participation Domain of the SIS consists of eight items rated on a 5-point Likert

scale (1 = “none of the time”; 5 = “all of the time”). Items include participation in fulfilling responsibilities, in interpersonal relationships, in community life, in employment, in spirituality, in leisure and in controlling one’s life. Total scores for the Participation Domain are calculated on a continuous scale from “0”, indicating a poor outcome, to “100”, indicating the best outcome. Each question is prefaced with the phrase, “in the past 4 weeks...” The SIS V 3.0 has been validated for use with persons with hemorrhagic and ischemic stroke ranging in severity from mild to severe (Duncan et al., 2003; Duncan et al., 1999). A Rasch analysis for the SIS V 3.0 confirmed the reliability of the tool where the separation reliability of all the domains ranged from .93 to 1.00 (Duncan et al., 2003).

Exposure variables

Depressive symptomatology was assessed at baseline (prior to 2 weeks post-stroke), by the Stroke Specific Geriatric Depression Scale (SS-GDS) (see Appendix C). The SS-GDS was developed by conducting a Rasch analysis from the 30 item GDS with a stroke population (see Appendix D). The GDS is a screening measure for depressive symptoms in the elderly whereas the SS-GDS is specific for a stroke population, having removed items that may be symptoms of the neurological incident rather than depression. Examples of such items include “Do you feel that you have more problems with your memory than most?”, “Is your mind as clear as it used to be?” or “Is it hard for you to get started on new projects?” The SS-GDS is a self-rated questionnaire comprised of 17 items questions to which the subject answers “yes” or “no”. Total scores for the SS-GDS are calculated on a continuous scale from “0” to “17”, where greater scores indicate greater severity of depression. The GDS has a reported reliability coefficient of .90 in a sample of

geriatric stroke patients (Agrell & Dehlin, 1989). A cut-off point of 10 or greater on the GDS has been shown to demonstrate 84% sensitivity and 95% specificity to detect depression in a stroke sample (Agrell et al., 1989). Although the psychometric properties of the SS-GDS have been less investigated than those of the GDS, the SS-GDS has demonstrated evidence of reliability and validity (Cinamon, Finch, Miller, Higgens, & Mayo, 2009).

Function was assessed at baseline by the Barthel Index (see Appendix E). The Barthel Index is an interviewer-administered measure that evaluates functional independence, specifically the activities related to a person's daily functioning. Ten ADL are assessed: bowel control, bladder control, personal hygiene, toilet transfer, bathtub transfer, feeding, dressing, wheelchair transfer to and from bed, walking or wheelchair management and ascending and descending stairs. Each self-care item is rated on a 3-point scale by determining if the patient can perform the activity independently, only with assistance or supervision, or not at all. Items carry variable weights (0, 5 or 10). The scores reflect the amount of time and assistance a patient requires. Total scores for the Barthel Index are calculated on a continuous scale from "0", indicating functional dependence, to "100", indicating functional independence. The Barthel Index has been found to correlate highly with other indices of ADL in stroke populations. Concurrent validity is therefore supported (Balu, 2009). The Barthel Index is reported to be reliable for use in stroke rehabilitation with test-retest reliability of 0.89 and inter-rater reliability of 0.95 (Balu, 2009).

Confounders

Confounding variables include age, co-morbid conditions and a history of depression. Age data were collected from hospital medical charts.

Diagnosis of a history of depression was assessed 3 months post-stroke using the Structured Clinical Interview for the Diagnosis and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) Axis I Disorders (SCID) for depression (First, Spitzer, Gibbon, & Williams, 2009) (see Appendix F). The SCID is considered to be the gold standard for a research diagnosis of depression. It is a semi-structured interview developed to itemize the number and types of depression symptoms according to DSM-IV criteria (see Appendix G) (American Psychiatric Association, 1994). Items pertaining to a history of depression include dating of onset, duration and clustering of symptoms as well as functional impairment during worst major depressive episode (MDD). Exclusion questions based on DSM-IV criteria are also asked (e.g., episode reported to be secondary to a medical illness, bereavement, or substance use). The SCID was scored as a dichotomous variable where participants either had or did not have a history of depression. Adequate reliability has been demonstrated in numerous studies (Williams et al., 1992).

Co-morbid conditions were assessed at baseline against a self-report checklist of co-existing conditions that are prevalent in the stroke population (see Appendix H). Total scores for co-morbid conditions are calculated on a continuous scale from “0” to “19”, where greater scores indicate a greater number of co-morbid conditions.

Stroke characteristic and socio-demographic information

Information characterizing participants' stroke was obtained from medical charts. This information included the side of the hemiplegia (e.g., left, right or bilateral), the side of the lesion (e.g., left, right or bilateral), the type of stroke (e.g., ischemic or hemorrhagic) and whether it was the first occurrence of a stroke incident or not. Stroke severity was measured at baseline using the CNS (see Appendix I). The CNS is an interviewer-administered measure designed to assess neurological function in conscious stroke patients. It assesses domains of consciousness, orientation, aphasia and motor strength. Each domain is assigned a score and an ordinal total score from "0" to "11.5" is calculated. Greater scores indicate a less severe stroke. The CNS demonstrated adequate reliability and validity (Côté et al., 1989).

Participants also provided information at baseline about who they lived with prior to their stroke (e.g., spouse, alone, family or other), where they lived prior to their stroke (e.g., home, residence, or other) and their educational attainment (e.g., primary school, secondary school or post-secondary school).

Procedures

Patients admitted for stroke were actively tracked at the three acute care facilities. Once the discharge plan had been formulated, eligible patients were introduced to the study, in-person, by a stroke unit nurse. Those who expressed interest were then approached by the study coordinator who provided them with additional details about the study. Informed consent was obtained from those who were willing to participate (see Appendix J) and met inclusion criteria.

Participants were assessed comprehensively at baseline (within 2 weeks of the stroke incident), regardless of whether they were in acute care, had been discharged to inpatient rehabilitation, or had been sent home. Subsequent comprehensive assessments following the same protocol were conducted at 3, 6, 9 and 12 months following stroke. Between these intervals, participants were assessed via telephone on a biweekly basis for the first three months and then on a monthly basis for the remainder of the study. The time line of assessments is illustrated in Figure 1. Both the comprehensive and telephone assessments were carried out by trained interviewers. The current study examined data from the baseline, 3- and 6-month comprehensive assessments.

The study was reviewed and approved by the Research Ethics Board of the McGill University Health Center and by Concordia University's Office of Research. Ethical approval was also obtained from each participating hospital. Care was taken to assure the stroke survivors that participation was completely optional and that a decision not to participate would not result in any negative consequences. Participants provided written informed consent to participate in this study. Appropriate referrals to health practitioners were made in instances where participants were suspected of being at risk for adverse health events (such as depression, suicide, etc.). Compensation was not provided to the participants.

Sample Size Estimation

A minimum of 77 participants was required for a multiple linear regression that included three explanatory variables and one outcome variable, adjusted for three confounders. This estimate is based on Green's (1991) formula for estimating sample sizes for regression with less than seven predictors $((50 + 8 * \text{number of predictors}) + 1)$

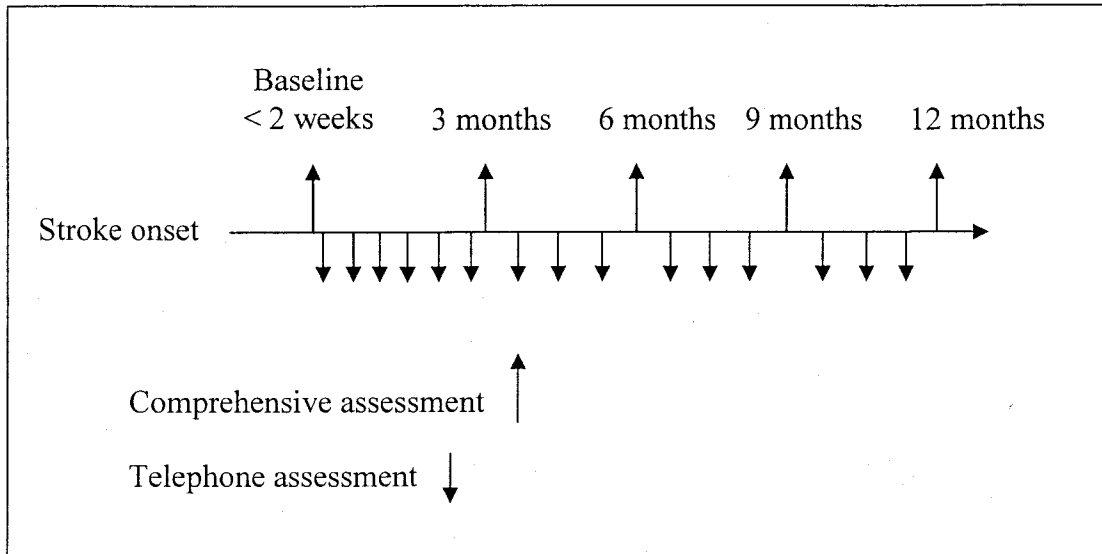
degree of freedom per confounder). A sample size of 77 participants was considered to be sufficient to detect relationships among variables with moderate effect-size, with 80% power and a Type 1 error risk of 0.05. The sample size was estimated based on a moderate effect-size, since a fair effect-size would not likely be clinically meaningful. It was also estimated based on 80% power, which is proposed by Cohen (1988) as being appropriate for a range of behavioural research areas. The current study was not powered to detect the effect of an interaction between gender and depressive symptomatology on participation. To have sufficient statistical power to detect the effect of an interaction, Brookes et al. (2004) suggest a sample size 4 times greater than that required to detect a main effect. Given that the current study was not powered to detect an interaction, the current study sought to examine the interaction between gender and depressive symptomatology on participation on an exploratory basis, contributing to the evidence for a potential interaction.

Missing Data

Methods of handling missing data include listwise deletion or imputation. Listwise deletion is the default approach to dealing with missing data in most statistical software packages where any case with data missing on any variable involved in the analyses is dropped from the sample. In other words, it only uses cases with complete data for the analyses. A disadvantage of the listwise deletion method is that it may reduce the sample size considerably since data with missing values are removed from the analyses. Consequently, this reduces statistical power of the analyses since power relies in part on a large sample size. The listwise deletion method may also be problematic when the data is missing not at random. Data are considered to be missing not at random

Figure 1

Timeline of Assessments



when the reason for observations being missed depends on the unseen observations themselves (Allison, 2001). In this event, an analysis that was based on complete cases would lead to biased findings.

Another method of dealing with missing data is imputation, in which the missing value is substituted with an estimated one. In simple imputation, missing values can be replaced either with the value of the marginal mean or when the last observation is carried forward. The problem inherent in these methods of imputation is that they typically produce standard errors that are underestimated, resulting in inflated test statistics (Allison, 2001). An alternative to these single imputation methods described is multiple imputation, which is a well validated approach to estimating missing values when the data are missing at random (Allison, 2001). As with other methods of imputation, multiple imputation allows for the use of the entire dataset. Multiple imputation involves substituting n values for each unobserved value, based on the available data, so as to create n complete datasets. Considered together, these n values represent the imputed value of a data point as well as the uncertainty of the imputations. Regression models can then be tested on each of the n datasets. This produces n coefficients for each predictor, which can be averaged. The standard error is adjusted to reflect both the estimated uncertainty and the uncertainty arising from the imputation process. As such, multiple imputation yields improved estimates of the variance, as compared to other conventional single imputation techniques, by accounting for variability in the imputation procedure (Allison, 2001).

From the 111 individuals that agreed to participate, 66 participants had progressed as far as the 6-month assessment at the time the current study conducted the analyses.

Table 4 presents the percentage of missing data for each variable included in the study for the sample of 111 participants, referred to as the “complete sample”, and describes the method chosen to deal with the missing data. The frequency of missing values (per variable) ranged from 4% to 41%. Specifically, 41% of the outcome variable (participation) was missing and 20% of the exposure variable (SS-GDS) was missing. Given that the missing data on the outcome variable was due to the fact that 45 participants had not completed the 6-month assessment, analyses were also conducted on the 66 participants who had progressed as far as the 6-month assessment. Table 5 presents the percentage of missing data for each variable included in the study for these 66 participants, referred to as the “6-month sample”, and describes the method chosen to deal with the missing data. The frequency of missing values (per variable) ranged from 2% to 12% where history of depression, a confounding variable, was missing 12%.

Given that 45 out of the total sample of 111 participants in the complete sample had missing observations on at least one variable, listwise deletion resulted in a substantial reduction in sample size. This, in turn, would result in decreased power. The multiple imputation procedure was therefore proposed as a method to deal with unobserved values in the complete sample. This allowed for the retention of a greater amount of cases thereby maintaining statistical power. The following variables were included in the imputation model: participation measured at 3 and 6 months, depressive symptomatology measured at 3 and 6 months, functional independence measured at baseline, history of depression measured at 3 months, gender, age and co-morbid conditions. Estimations were bound to values appropriate for the variable being imputed. Estimations were performed using PROC MI in SAS v9.2, with a multiple chain full

Table 4

Percentage of Missing Data by Variable and Method of Dealing with Missing Data for Complete Sample (n=111)

Variable	Percentage of missing data	Method of dealing with missing data
<i>Variable collected at 6 months</i>		
SIS-P	41	Multiple imputation
<i>Variable collected at 3 months</i>		
History of depression	38	Multiple imputation
<i>Variables collected at baseline</i>		
Age	4	Mean imputation
Gender	0	N/A
Co-morbid conditions	5	Multiple imputation
SS-GDS	20	Multiple imputation
Barthel Index	9	Multiple imputation

Note. SIS-P = Stroke Impact Scale –Participation Domain; SS-GDS = Stroke Specific Geriatric Depression Scale.

Table 5

Percentage of Missing Data by Variable and Method of Dealing with Missing Data for 6-month Sample (n=66)

Variable	Percentage of missing data	Method of dealing with missing data
<i>Variable collected at 6 months</i>		
SIS-P	0	N/A
<i>Variable collected at 3 months</i>		
History of depression	12	No history of depression
<i>Variables collected at baseline</i>		
Age	0	N/A
Gender	0	N/A
Co-morbid conditions	2	Mean imputation
SS-GDS	2	Mean imputation
Barthel Index	2	Mean imputation

Note. SIS-P = Stroke Impact Scale –Participation Domain; SS-GDS = Stroke Specific Geriatric Depression Scale.

imputation with the MCMC method. A total of five imputed complete datasets were created, which is considered to be a reasonable number of imputations (Allison, 2001). PROC MIANALYZE in SAS v9.2 was then used to combine the results from regression analyses of the five imputed datasets. All analyses were conducted with both the complete sample and the 6-month sample.

Statistical Analyses

All statistical analyses were carried out using SAS v9.2 (SAS institute, 100 SAS Campus Dr, Cary NC 27513). Descriptive analyses were conducted to characterize the complete sample and 6-month sample. Zero-order correlations were conducted to assess the relationship between the exposure variables and the outcome in both samples and to determine if multicollinearity was present. The assumptions of multiple linear regression were verified using graphical and descriptive methods in both samples, prior to testing the model.

Multiple linear regression analyses were used to test the model in both samples. Regression analyses with forced entry within each batch were conducted to test the study's hypotheses. First, participation was regressed on age, co-morbid conditions and history of depression (Batch 1), depressive symptomatology, gender and functional independence (Batch 2) and the interaction term of gender*depressive symptomatology (Batch 3). In all statistical analyses, a two-tailed test with a p value of .05 was considered statistically significant. Results from both samples were compared.

Results

Characteristics of the Sample

The complete sample had a mean age of 70 years, with more men (59%) than women. Approximately half of the participants went to inpatient rehabilitation upon discharge from the acute care center (59%). Almost all participants lived at home (90%) before the stroke and nearly half (46%) lived with a spouse. The majority of the sample (49%) had attained a post-secondary education. Nearly all cases were ischemic strokes (92%) and first time strokes (83%). Just over half of the participants (53%) had hemiplegia on the left side and 58% of the participants having had a lesion on the right side. The mean score on the CNS was 8 out of 11.5, where greater scores indicate less severe strokes.

The 6-month sample had a mean age of 69 years, with more men (56%) than women. Approximately half of the participants went to inpatient rehabilitation upon discharge from the acute care center (61%). Almost all participants lived at home (92%) before the stroke and nearly half (46%) lived with a spouse. The majority of the sample (57%) had attained a post-secondary education. Nearly all cases were ischemic strokes (94%) and first time strokes (89%). Just over half of the participants (49%) had hemiplegia on the left side, 56% of the participants having had a lesion on the right side. The mean score on the CNS was 8 out of 11.5.

Characteristics describing the samples are presented in Table 6 while characteristics of the samples on model variables are provided in Table 7. Chi-square (χ^2) and *t*-tests were used to contrast the 6-month sample and the complete sample. There were no

Table 6

Characteristics of the Samples

Variable or measure	Complete Sample (n=111)	6-month Sample (n=66)
Stroke characteristics		
CNS, mean \pm SD (range)	8 \pm 3.0 (1.5 – 11.5)	8 \pm 2.5 (1.5 – 11.5)
Side of hemiplegia		
Left	59 (53)	34 (51)
Right	37 (33)	21 (32)
Bilateral	15 (14)	11 (17)
Side of lesion		
Right	64 (58)	38 (58)
Left	44 (39)	27 (41)
Bilateral	3 (3)	1 (1)
Type of stroke		
Ischemic	102 (92)	62 (94)
Hemorrhagic	9 (8)	4 (6)
First stroke		
Yes	89 (83)	59 (89)
No	18 (17)	7 (11)
Unreported	4 (4)	0 (0)
Discharge destination		
Inpatient rehabilitation	66 (59)	40 (61)

Home	35 (32)	23 (35)
Transfer to another acute care facility	4 (4)	3 (4)
Unreported	6 (5)	0 (0)
Living situation		
Home	99 (90)	61 (92)
Other	11 (10)	5 (8)
Living with whom		
Spouse	51 (46)	29 (44)
Alone	40 (36)	24 (36)
Family	12 (11)	9 (14)
Other	8 (7)	4 (6)
Education		
Post-secondary	55 (49)	37 (57)
Secondary school	23 (21)	12 (18)
Primary school	29 (26)	16 (25)
Unreported	4 (4)	0 (0)

Note. Values are *n* and values in parentheses reflect percentages unless otherwise specified. CNS = Canadian Neurological Scale.

Table 7

Characteristics of the Samples on Model Variables

Variable or measure	Complete Sample (<i>n</i> =111)	6-month Sample (<i>n</i> =66)
Age, years, mean \pm SD (range)	70 \pm 13. (27 – 93)	69 \pm 11.2 (35 – 93)
Gender		
Male	65 (59)	36 (55)
Female	46 (41)	30 (45)
Co-morbid conditions	2 \pm 2.3 (0 – 8)	2 \pm 2.2 (0 – 8)
History of depression		
No history of depression	89 (80)	54 (82)
History of depression	22 (20)	12 (18)
SS-GDS, mean \pm SD (range)	4 \pm 2.8 (0 – 14)	4 \pm 2.7 (0 – 11)
Barthel Index, mean \pm SD (range)	62 \pm 33.2 (0 - 100)	71 \pm 27.2 (0 – 100)
SIS-P, mean \pm SD (range)	62 \pm 29.4 (0 – 100)	64 \pm 27.9 (0 – 100)

Note. Values are means \pm SD and values in parentheses reflect ranges unless otherwise specified. SS-GDS = Stroke Specific Geriatric Depression Scale; SIS-P = Stroke Impact Scale – Participation Domain.

differences between samples with respect to characteristics of the sample and model variables.

Zero-Order Correlations

Pearson product-moment coefficients were used to evaluate associations between age, co-morbid conditions, history of depression, depressive symptomatology, gender, functional independence and participation. Zero-order correlations of the complete sample and the 6-month sample are displayed in Tables 8 and 9 respectively.

Results using the complete sample revealed that SIS-P was positively correlated with Barthel Index ($r = .62, p < .001$), suggesting that greater functional capacity at baseline was associated with greater levels of participation 6 months post-stroke. The effect size for the relation between SIS-P and Barthel Index was considered to be large according to Cohen's (1988) guidelines for the social sciences. The relation between scores on the SIS-P and the SS-GDS was not significant ($r = -.08, p > .05$) nor was the association between the SIS-P and gender ($r = -.08, p > .05$). SS-GDS was not significantly associated with gender or the Barthel Index ($r = -.01, p > .05$). Finally, the relation between scores on the Barthel Index and gender was not significant ($r = .06, p > .05$).

Results using the 6-month sample revealed that the SIS-P was positively correlated with Barthel Index ($r = .49, p < .001$), suggesting that greater functional capacity at baseline was associated with greater levels of participation at 6 months post-stroke. This was considered to be a large effect size. Results also revealed that SIS-P was negatively correlated with SS-GDS ($r = -.37, p < .001$), suggesting that fewer depressive symptoms at baseline was associated with greater participation at 6 months post-stroke.

Table 8

Zero-order Correlations between Model Variables with Complete Sample (n=111)

	1	2	3	4	5	6	7
1. Age	-						
2. Co-morbid conditions	.05	-					
3. History of depression	-.21**	-.06	-				
4. SS-GDS	-.05	.12*	-.01	-			
5. Gender	.17**	.03	.20**	.06	-		
6. Barthel Index	-.30**	-.09*	.09*	-.01	.06	-	
7. SIS-P	-.05	-.22**	-.22**	-.08	-.08	.62**	-

Note. SS-GDS = Geriatric Depression Scale - Stroke Specific; SIS-P = Stroke Impact Scale – Participation Domain.

* $p < .05$. ** $p < .01$.

Table 9

Zero-order Correlations between Model Variables with 6-month Sample (n=66)

	1	2	3	4	5	6	7
1. Age	-						
2. Co-morbid conditions	-.18	-					
3. History of depression	-.12	-.11	-				
4. SS-GDS	-.11	.24	.01	-			
5. Gender	.13	-.09	.20	.02	-		
6. Barthel Index	-.25**	-.04	.14	-.30*	.07	-	
7. SIS-P	-.06	-.18	-.14	-.37**	-.12	.49**	-

Note. SS-GDS = Geriatric Depression Scale - Stroke Specific; SIS-P = Stroke Impact Scale – Participation Domain.

* $p < .05$. ** $p < .01$.

This was considered to be a large effect size. Function was found to be negatively correlated with SS-GDS ($r = -.30, p < .05$), suggesting that greater functional capacity was associated with fewer depressive symptoms. This was considered to be a moderate effect size. The associations between gender and SIS-P ($r = -.12, p > .05$), gender and the SS-GDS ($r = .02, p > .05$) and gender and the Barthel Index ($r = .07, p > .05$) were not significant.

The magnitude and direction of the correlations differed between the complete and 6-month samples. In particular, the magnitude of the relation between SIS-P and SS-GDS was found to be significantly different when comparing confidence intervals around rho. In the complete sample, the association between SIS-P and SS-GDS was small ($r = -.08, p > .05$), whereas the association in the 6-month sample was large ($r = -.37, p < .001$). Furthermore, the relation between the Barthel Index and SS-GDS was significantly different when comparing confidence intervals around rho. The association between Barthel Index and SS-GDS was small ($r = -.01, p > .05$) in the complete sample, whereas the association in the 6-month sample was moderate ($r = -.30, p < .05$). The magnitude and direction of all other associations were similar when comparing both samples. Due to the larger sample size in the complete sample, several pairs of variables were significantly correlated in the complete sample, though these effects had not reached significance in the 6-month sample.

Testing the Assumptions of Multiple Regression

The adequacy with which multiple linear regression yields meaningful estimates depends on several assumptions concerning both the variables used in the analyses and the structure of the resulting error term. Fortunately, a number of assumptions relevant to

multiple regression are accepted as being "robust" to violation (Osbourne & Waters, 2002). For that reason, an emphasis was made on the assumptions of multiple regression that are not robust to violation and which, if violated, can be dealt with. For the purpose of the current study, the underlying assumptions of multiple linear regression that were targeted were linearity, homoscedasticity, normality, multicollinearity and scanning for multivariate outliers.

Examination of residual scatterplots of predicted participation by errors of prediction was performed in both samples to test assumptions of linearity, homoscedasticity and normality. In accordance with the assumptions of regression: (1) an inspection of residuals indicated that they were normally distributed; (2) an examination of the predicted and standardized residuals revealed relatively constant error variance; and (3) a determination of the correlations between independent variables and residuals indicated that they were nonsignificant.

To test the assumption of multicollinearity, an examination of the correlation matrix and the Tolerance or Variance Inflation Factor (VIF) was done in both samples. The correlation matrix revealed that multicollinearity was not present in the current data. A "cut-off" value does not exist for which one could conclude with certainty that multicollinearity is problematic when using the VIF; however, many researchers suggest that, as a general 'rule of thumb,' multicollinearity becomes an issue only when the VIF is greater than 2.5 (Allison, 1999). Examination of VIF suggested that multicollinearity was not problematic for these data.

Multivariate outliers are cases with extreme values with respect to multiple variables. These were identified using Cook's distance, leverage and DFITS that assess

the overall impact of an observation on the estimated regression coefficient. Multivariate outliers are operationally defined as cases which have a Cook's Distance greater than a cut-off of $4/n$, where n is the number of cases; or a leverage value greater than a cut-off of $(2k+2)/n$, where k is the number of independent variables; or where a DFITS value is greater than a cut-off of $2*\sqrt{k/n}$. One multivariate outlier was identified in both samples, which was the same one using these three methods. The regression equations were fit both with as well as without the suspect point. The coefficients of the models, the mean-squared error and R^2 from the two models were compared. The two analyses yielded similar results. The outlying case was therefore retained in the dataset.

Regression Analyses

We expected depressive symptomatology, gender and functional independence at baseline would predict participation 6 months following stroke. Furthermore, we expected the relation between depressive symptomatology and participation would be stronger in women rather than men, beyond those afforded by demographic and baseline variables such as age, co-morbid conditions and a history of depression. Regression analyses were conducted with both the sample using listwise deletion and the complete sample.

To examine the main hypotheses of this study, regression analyses with forced entry within each batch were performed for the complete sample. In the first regression, participation was regressed on age, co-morbid conditions and history of depression, (Batch 1). These variables accounted for 12% of the variance in participation. Adding depressive symptomatology, gender and functional independence explained a significant additional 31.45% of the variance in participation (Batch 2) ($F(5,105) = 12.92, p < .05$).

Co-morbid conditions was found to be independently associated with participation ($B = -2.11$), where for every increase in one co-morbid condition, scores on SIS-P decreased by 2.11 points. History of depression was also found to be independently related to participation ($B = -15.89$), where a history of depression incurred a decrease of 15.89 points on the SIS-P. After the effects of age, co-morbid conditions and history of depression were taken into account, the unique contribution of the Barthel Index in predicting participation was found to be significant ($B = 2.65$), where for every 5 point increase on the Barthel Index, scores on the SIS-P increased by 2.65 points. Since neither gender nor SS-GDS were found to be significantly associated with participation, the gender*SS-GDS interaction term was not added as a third batch in the regression analyses.

To examine the main hypotheses of this study, regression analyses with forced entry within each batch were performed for the 6-month sample. In the first regression, participation was regressed on age, co-morbid conditions and history of depression, (Batch 1). These variables accounted for 6% of the variance in participation. Adding depressive symptomatology, gender and functional independence explained a significant additional 30.6% of the variance in participation (Batch 2) ($F(5,60) = 5.74, p < .05$). After the effects of age, co-morbid conditions and history of depression were taken into account, the Barthel Index uniquely contributed in the prediction of participation ($B = 2.45$), where for every 5 point increase on the Barthel Index, scores on the SIS-P increased by 2.45. Since neither gender nor SS-GDS were found to be significantly associated with participation, the gender*SS-GDS interaction term was not added as a third batch in the regression analyses. Table 10 displays the unstandardized regression

Table 10

Regression Analyses Predicting Participation of Both Samples

Model	Complete sample		6 months sample	
	B	SE B	B	SE B
		($R^2 = 43.35$)		($R^2 = 36.60$)
Age (per decade)	1.5	2.3	1.1	2.8
Number of co-morbid conditions (per condition)	-2.11*	0.97	-1.92	1.36
History of depression (no history vs. a history)	-15.89**	5.77	-13.89	7.74
SS-GDS	-1.19	1.00	-1.81	1.17
Gender (Men vs. women)	-4.16	4.90	-7.07	6.01
Barthel Index (per 5 points)	2.65**	0.45	2.45**	0.60

Note. SS-GDS = Stroke Specific Geriatric Depression Scale; B = unstandardized regression coefficients; SE B = standard error for unstandardized regression coefficients.

* $p < .05$. ** $p < .01$.

coefficients (B) and standard errors for the final models in both the complete sample and 6-month sample.

When comparing the results obtained from the final model in both samples, the magnitude and direction of the standardized regression coefficients of model variables are similar. The p values, however, changed likely as a result of the larger sample size. In the complete sample, history of depression and co-morbid conditions were found to be significant predictors of participation whereas these were not found to be significant in the 6-month sample.

Comparing Samples

The discussion section that follows was based on results from the 6-month sample. In comparing findings from both samples, zero-order correlations between model variable were found to be similar with the exception of the relation between the SIS-P and the SS-GDS. The difference in magnitude between the correlation coefficients when comparing both samples was considerable. The association between SIS-P and SS-GDS in the complete sample was found to small ($r = -.08, p > .05$), whereas this association was found to be large in the 6-month sample ($r = -.37, p < .001$). The explanation as to why the association between most model variables was similar except for the association between SIS-P and SS-GDS is likely related to the fact that it was the SIS-P and the SS-GDS that were missing the most amount of values. The proportion of missing data for the SIS-P was 41% and 20% in the SS-GDS. Conducting multiple imputation for the complete sample on a large proportion of missing values resulted in considerably different correlation coefficients characterising the relation between SIS-P and SS-GDS as compared to the 6-month sample. Although characteristics of the samples and model

variables were not found to be different and standardized regression coefficients during regression analyses were found to be similar using both samples, given the large amount of missing data imputed in the complete sample, it was considered more prudent to use the results generated by the 6-month sample.

Discussion

The present study investigated the factors in the acute stroke period that relate to future participation in stroke survivors. Knowledge of the factors related to participation is necessary to identify people at an increased risk for experiencing restrictions in participation following stroke. A clearer understanding of the factors associated with participation would help guide both the research and delivery of rehabilitation intervention programs. This study set out to estimate the independent contributions of depressive symptomatology, gender and functional independence and the hypothesized interaction between gender and depressive symptomatology during the acute post-stroke period in predicting participation beyond those afforded by age, co-morbid conditions and history of depression.

Functional independence was found to be the only variable to be independently related to participation on the Participation Domain of the Stroke Impact Scale (SIS-P). Greater functional dependence 2 weeks post-stroke was related to less participation 6 months later, when these stroke survivors had returned to the community. This finding is consistent with previous studies that demonstrated that restriction in participation is positively related both to indices of physical limitation (Desrosiers et al., 2006; Desrosiers et al., 2008; Gum, Snyder, & Duncan, 2006; Rochette, 2001) and functional dependence (Beckley, 2007; D'Alisa et al., 2005; Harwood, 1997).

Findings regarding the relation between functional independence early following stroke and participation are particularly useful for rehabilitation interventions. As previously mentioned, most gains in function are made within the first three months following stroke (Kelly-Hayes et al., 1989). It is thus particularly important to identify

the stroke survivors at risk for restrictions in participation early on so that they may benefit from rehabilitation intervention during the optimal 3 month window. This may prevent restricted participation upon their return to the community. The current study found that functional independence, measured within 2 weeks of having experience a stroke, predicted subsequent participation. These findings suggest that functional independence assessed within days of having a stroke may be used to screen stroke survivors to identify those at risk for restricted participation. Those at risk can benefit from rehabilitation early following stroke that targets their functional limitation.

Depressive symptomatology was not identified as a determinant of participation. Although a number of earlier studies had found depressive symptomatology to predict participation (Harwood, 1997; D'Alisa et al., 2005; Desrosiers et al., 2006; Desrosiers et al., 2008), results from the current study are consistent with two patterns that emerged from the literature. The first pattern may be related to the timing of the assessment. Rochette et al. (2001), D'Alissa et al. (2005), Desrosiers et al. (2006; 2008) reported that depressive symptomatology, when measured between 4 months and 5 years post-stroke, was related to participation. In contrast, neither Desrosiers et al. (2008), in a sample recruited from acute care, nor Gum et al. (2006), was able to identify depressive symptomatology as predictive of participation when it was assessed 1 month or less post-stroke. In this light, the findings of the current study is consistent with previous studies in which the depressive symptomatology measured early post-stroke may not be related to participation at a later point, whereas depressive symptomatology experienced later may be.

The second pattern may be related to the population sampled in previous studies. Studies that drew their sample from rehabilitation centers consistently identified depressive symptomatology as a predictor of participation (Rochette, 2001; D'Alisa et al., 2005; Desrosiers et al., 2006; Desrosiers et al., 2008), whereas studies that drew their sample from acute care facilities consistently did not (Gum et al., 2006; Desrosiers et al., 2008; Harwood, 1997). Results from the present study are in line with those of previous studies that also recruited samples from acute care facilities. A possible explanation for this pattern is that the participants who were recruited from a rehabilitation center generally had greater disability than participants recruited from the hospital. In Canada, only approximately 10% of stroke survivors receive inpatient rehabilitation services (Mayo et al., 1999). Given the limited availability of such services, stroke survivors admitted to rehabilitation centers are generally those with more severe disabilities. The vast majority of stroke survivors, whose disabilities are not so severe or not identified, return to the community with or without outpatient rehabilitation services (Edwards et al., 2006; Bates et al., 2005). In studies recruiting from rehabilitation centers, participants generally have greater disability participants and thus may have been at an increased risk for depression (Bruce, 2001). Although previous studies have discussed the importance of identifying and treating depressive symptomatology among stroke survivors so as to help them resume and maintain meaningful pursuits and roles, findings suggest that this may be more especially important in the case of individuals with more severe disabilities, such as those who have been admitted to rehabilitation. Interestingly, findings from the current study were consistent with those of earlier findings when depressive symptomatology was assessed using the SS-GDS rather than a standard assessment tool. Previous studies recruiting from an acute care facility also did not identify depressive

symptomatology to be a predictor of participation when using standard assessment tools to assess depressive symptoms that were not tailored specifically for use with a stroke sample. It has been proposed that the use of such tools may result in inflated depression measures since scores may therefore be confounded either by neurologic symptoms that result from the stroke or by nonspecific distress, rather than depression (Schramke et al., 1998). The current study showed that even when using the Stroke-Specific Geriatric Depression Scale (SS-GDS) which excludes items that may relate to the neurological damage, depressive symptomatology did not predict participation. These findings lend support to the notion that depressive mood may not be a factor to consider with respect to participation in a general stroke population.

Although the zero-order correlation between participation and depressive symptomatology revealed a strong association between these variables ($r = -.37, p < .01$), depressive symptomatology was not found, independently, to predict scores on the SIS-P ($B = -.20$) when the effects of age, co-morbid conditions, history of depression, function and gender were taken into account. Regression analyses were reran three times, at each, excluding one of the confounding variables. This was done to identify which factor, aside from SS-GDS, accounted for the variance in SIS-P. Neither excluding age nor excluding history of depression changed the unique contribution of depressive symptomatology to the prediction of participation. Interestingly, when co-morbid conditions were excluded from analyses, SS-GDS was found to predict participation. However, when considered together, SS-GDS did not predict participation beyond the effect of co-morbid conditions. The association between co-morbid conditions and depressive symptomatology was moderate ($r = .24, p > .01$). These findings suggest that co-morbidity may be an

important variable to consider in participation. These findings are in line with earlier studies that reported that participants who had more co-morbid conditions had lower levels of participation after stroke as compared to participants who had fewer co-morbid conditions (Desrosiers et al., 2006; Desrosiers et al., 2008; Rochette, 2001). Other research studies have also shown the importance of co-morbid conditions in other outcomes following stroke, in particular, with respect to functional independence, total numbers of medications, therapeutic interventions, consultations and length of stay in hospital for stroke admission (Giaquinto, 2003; Di Libero, Fagnoli, Giaquinto, & Pittiglio, 2001; Lui, Domen, & Chino, 1997). Although results from the current study did not identify co-morbid conditions as an independent predictor, such co-morbid conditions may need to be considered when estimating an individual's engagement in meaningful pursuits and roles after stroke. Additional research is necessary to confirm this relationship.

Gender was not found to be related to participation. This is consistent with other studies which failed to find a gender-participation relationship (Desrosiers et al., 2006; D'Alisa et al., 2005; Beckley, 2007; Rochette, 2001). Findings confirmed that, as stroke survivors return to their pre-stroke engagements, gender may not be an important factor to consider.

An interaction between gender and depressive symptomatology in predicting participation was also not found. It was hypothesized that men, as compared to women, would demonstrate greater decreases in participation as their depressive symptoms increase. The hypothesis that gender and depressive symptomatology interact to affect participation was not supported. It is important to note that the current study was not

sufficiently powered to detect an interaction. Thus, findings regarding the hypothesized interaction are exploratory. Despite this, when the effects of confounding and predictor variables were taken into account, the effect size of the interaction term was small. The present findings lend support to the hypothesis that an interaction between gender and depressive symptomatology does not predict participation.

In the present study, a history of depression was not related to participation in the 6 month sample. To the author's knowledge, the influence of a history of depression on participation has not been examined to date. History of depression had been identified as a predictor in the complete sample and as such, further research is necessary to confirm whether or not screening for a history of depression may be helpful in the rehabilitation process.

Age was not found to be a significant predictor of participation following stroke. Earlier studies that examined age as a determinant of participation yielded inconsistent results. Desrosier et al. (2008) identified age as a determinant of participation at 3 and 6 months following stroke. Age has also been identified as a factor related to participation at 6 months and between 2 and 4 years after stroke (Desrosiers et al., 2006). In 2002, Desrosier et al. also found age to predict participation 6 months following stroke. Desrosier et al. (2001) also found age to be independently related to participation at 6 months post-stroke. Conversely, Beckley (2007) did not find age to predict participation at 3 to 6 months post-stroke. Harwood et al (1996) did not find age to be a predictor of participation between 2- and 3-years. It is unclear as to why studies have yielded inconsistent results with regards to age as a predictor of participation given that the mean

age and range were similar in all studies. Findings from the current study support the hypothesis that age is not a factor to consider when examining participation.

Cognitive abilities had been found to be independently related to participation (Desrosiers et al., 2008; Gum, Snyder and Duncan, 2006; Rochette, 2001). It was decided, for the current study, not to include cognitive abilities as a model variable given that stroke survivors with severe cognitive impairment were excluded from the sample for ethical purposes, as these individuals were unable to provide informed consent. Cognitive abilities were thus not considered a contributor to participation.

Limitations

Since the complete sample using multiple imputation yielded inconsistent results when compared with those of the sample having attained the 6-month assessment, the present study reported findings based on the 6-month sample. This incurred a decrease in sample size, thereby resulting in a decrease in statistical power, lower than that which is typically recommended to detect meaningful changes. Results from this study must therefore be considered as exploratory. A second limitation may be related to the fact that there had been multiple interviewers administering the testing material which may have had an impact on the responses of the participants.

Future Directions

These findings lend support to the notion that early on, the physical sequelae of stroke are more predictive of future participation. Capacity to do basic activities of daily living (ADL), which is the construct measured by the Barthel Index, is a strong indicator of stroke severity. People who are dependent for accomplishing ADL will likely take a long time before they are ready to venture outside of the home and engage in activities in

the community, hence, the strong relationship between function and participation at 6 months. However, it is important to note that only 37% of the variance of participation at 6 months was explained by the variables included in this study. This suggests that it is insufficient to focus only on the early post-stroke period assessment and intervention which is the reality for persons who do not go for post-stroke rehabilitation. In the current sample, 39% of participants did not receive rehabilitation services following discharge from the acute care facility. As such, other factors must be taken into account for this portion of stroke survivors that will not have access to rehabilitation that targets ADL. Factors such as environmental barriers, self-efficacy, motivation and coping style, for instance, may be related to restrictions in participation and perhaps essential for an individual to adequately reintegrate into the community and readopt roles once occupied prior to stroke. Future studies are necessary to get a better understanding of the factors related to participation that are relevant to stroke survivors who receive rehabilitation services and those who do not.

Future research is required to investigate whether determinants predicting participation differ depending on time since the stroke incident. It would be interesting to ascertain whether functional independence continues to be important in predicting participation after 6 months following stroke or whether factors such as depression or gender or their interaction become more important at a later stage. Future research is also needed to examine treatment protocols to prevent and decrease limitations in participation.

Finally, as this study was completed as part of the requirements for a Master's degree, there was a strong emphasis on learning the research process rather than

mounting a study to answer a specific question. This analysis was part of a larger study looking specifically at the longitudinal relationships with depression and stroke outcomes. The analyses in the longitudinal environment are far more complex and will be undertaken by the statistician on the main study. My contribution to this study was in the assessments, data collection and data entry. The regression analyses were conducted primarily as exploratory in preparation for future analyses taking full advantage of the longitudinal nature of the study. I had the opportunity to learn many of the processes involved in research and I look forward to advancing my methodological and analytical skills in future work.

Conclusion

The current study contributes to the understanding of the factors related to participation after stroke. This study provides evidence that functional independence evaluated at 2 weeks post-stroke independently contributed to restrictions in participation in stroke patients 6 months following stroke. Furthermore, depressive symptomatology, gender and an interaction between gender and depressive symptomatology were not found to predict participation, at this early stage.

Factors found to be independently associated with participation may be modified and thus warrant special attention in rehabilitation interventions. As functional independence soon after stroke was found to be an important predictor of participation as individuals with stroke return to their normal living situations both in the current study and in several others and that restrictions in participation are associated with negative outcomes such as reduced QOL and life satisfaction, functional independence should be screened and targeted soon after stroke. Stroke survivors make the most gains in function

within the first three months following stroke and, as such, those at risk for restricted participation should be targeted early.

Restrictions in the stroke survivor's ability to participate in social situations and meaningful activity threaten his or her's QOL and life satisfaction. Including participation as part of the evaluation of stroke outcome may contribute towards a better strategy for preventing further health decline and isolation (Bhogal, 2003). Considering the impact of restricted participation, the consequences of stroke need to be viewed more broadly. An understanding of the factors related to participation is necessary to identify those at an increased risk for experiencing restrictions in participation following stroke that would benefit from rehabilitation intervention preventing restrictions in participation.

References

- Agrell, B. & Dehlin, O. (1989). Comparison of six depression rating scales in geriatric stroke patients. *Stroke*, *20*, 1190-1194.
- Allison, P. (2001). *Missing data*. Thousand Oaks, CA: Sage.
- Anderson, C. S., Vestergaard, K., Riis, J., & Lauritzen, L. (1994). Incidence of post-stroke depression during the first year in a large unselected stroke population determined using a valid standardized rating scale. *Acta Neurologica Scandinavica*, *90*, 190-195.
- Angeleri, F., Angeleri, V. A., Foschi, N., Giaquinto, S., & Nolfè, G. (1993). The influence of depression, social activity, and family stress on functional outcome after stroke. *Stroke*, *24*, 1478-1483.
- Astrom, M., Adolfsson, R., & Asplund, K. (1993). Major depression in stroke patients. A 3-year longitudinal study. *Stroke*, *24*, 976-982.
- Balu, S. (2009). Differences in psychometric properties, cut-off scores, and outcomes between the Barthel Index and Modified Rankin Scale in pharmacotherapy-based stroke trials: systematic literature review. *Current Medical Research and Opinion*, *25*, 1329-1341.
- Bates, B., Choi, J. Y., Duncan, P. W., Glasberg, J. J., Graham, G. D., Katz, R. C. et al. (2005). Veterans Affairs/Department of Defense Clinical Practice Guideline for

the Management of Adult Stroke Rehabilitation Care: Executive Summary.
Stroke, 36, 2049-2056.

Beckett, L. A., Brock, D. A., Lemke, J. H., Mendes de Leon, C. F., Guralnik, J. M., & Fillenbaum, G. G. (1996). Analysis of change in self-reported physical function among older persons in four population studies. *Am J Epidemiol*, 143, 766-778.

Beckley, M. N. (2007). The influence of the quality and quantity of social support in the promotion of community participation following stroke. *Australian Occupational Therapy Journal*, 54, 215-220.

Bhogal, S., Teasell, R., Foley, N., & Speechley, M. (2003). Community reintegration after stroke. *Topics in Stroke Rehabilitation*, 10, 107-129.

Bhogal, S. K. (2003). Community integration after stroke. *Topics in Stroke Rehabilitation*, 10, 107-130.

Bonita, R., Stewart, A., & Beaglehole, R. (1990). International trends in stroke mortality: 1970-1985. *Stroke*, 21, 989-992.

Brookes, S. T., Whitely, E., Egger, M., Smith, G. D., Mulheran, P. A., & Peters, T. J. (2004). Subgroup analyses in randomized trials: risks of subgroup-specific analyses; power and sample size for the interaction test. *Journal of Clinical Epidemiology*, 57, 229-236.

Bruce, M. (2001). Depression and disability in late life: Directions for future research. *American Journal of Geriatric Psychiatry*, 9, 102-112.

- Burton, C. (2000). Living with stroke: A phenomenological study. *Journal of Advanced Nursing, 32*, 301-309.
- Burvill, P. W., Johnson, G. A., Jamrozik, K. D., Anderson, C. S., Stewart-Wynne, E. G., & Chakera, T. M. (1995). Prevalence of depression after stroke: the Perth Community Stroke Study. *The British Journal of Psychiatry, 166*, 320-327.
- Cardol, M., De Jong, B. A., & Ward, C. D. (2002). On autonomy and participation in rehabilitation. *Disability & Rehabilitation, 24*, 970-974.
- Caro, J. J., Huybrechts, K. F., & Duchesne, I. (2000). Management Patterns and Costs of Acute Ischemic Stroke : An International Study. *Stroke, 31*, 582-590.
- Carod-Artal, F. J. (2002). Functional recovery and instrumental activities of daily living: Follow-up one year after treatment in a stroke unit. *Brain Injury, 16*, 207-216.
- Carr, A. J. (1999). Beyond disability: measuring the social and personal consequences of osteoarthritis. *Osteoarthritis and Cartilage, 7*, 230-238.
- Chau, J., Thompson, D., Twinn, S., Chang, A., & Woo, J. (2009). Determinants of participation restriction among community dwelling stroke survivors: A path analysis. *BMC Neurology, 9*, 49.
- Cinamon, J., Finch, L., Miller, S., Higgens, J., & Mayo, N. (2009). A Stroke specific Geriatric Depression Scale: the SS-GDS. *Manuscript submitted for publication*.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. (2 ed.) Erlbaum, NJ: Hillsdale.

- Coster, W. J., Haley, S. M., Ludlow, L. H., Andres, P. L., & Ni, P. S. (2004).
Development of an applied cognition scale to measure rehabilitation outcomes.
Archives of Physical Medicine and Rehabilitation, 85, 2030-2035.
- Côté, R., Battista, R., Woldson, C., Boucher, J., Adam, J., & Hachinski, V. (1989). The
Canadian Neurological Scale: validation and reliability assessment. *Neurology*,
39, 638-643.
- D'Alisa, S., Baudo, S., Mauro, A., & Miscio, G. (2005). How does stroke restrict
participation in long-term post-stroke survivors? *Acta Neurologica Scandinavica*,
112, 157-162.
- Dam, H., Pedersen, H., & Ahlgren, P. (1989). Depression among patients with stroke.
Acta Neurologica Scandinavica, 80, 118-124.
- Desrosiers, J., Noreau, L., & Rochette, A. (2004). Social participation of older adults in
Quebec. *Aging Clinical and Experimental Research, 16*, 406-412.
- Desrosiers, J., Demers, L., Robichaud, L., Belleville, S., Ska, B., & Vincent, C. (2008).
Short-term changes in and predictors of participation of older adults after stroke
following acute care or rehabilitation. *Neurorehabilitation & Neural Repair, 22*,
288-297.
- Desrosiers, J., Noreau, L., Rochette, A., Bravo, G., Bourget, A., & Bourbonnais, D.
(2006). Predictors of long-term participation after stroke. *Disability and
Rehabilitation: An International, Multidisciplinary Journal, 28*, 221-230.

- Di Libero, F., Fagnoli, M., Giaquinto, G., & Pittiglio, S. (2001). Comorbidity and rehabilitation. *Archives of Gerontology and Geriatrics*, 32, 15-22.
- Dombovy, M. L., Basford, J. R., Whisnant, J. P., & Bergstralh, E. J. (1987). Disability and use of rehabilitation services following stroke in Rochester, Minnesota, 1975-1979. *Stroke*, 18, 830-836.
- Duncan, P., Bode, S., Lai, S., & Perera, S. (2003). Rasch analysis of a new stroke-specific outcome scale: The Stroke Impact Scale. *Archives of Physical Medicine and Rehabilitation*, 84, 950-963.
- Duncan, P. W., Wallace, D., Lai, S. M., Johnson, D., Embretson, S., & Laster, L. J. (1999). The Stroke Impact Scale Version 2.0 : Evaluation of Reliability, Validity, and Sensitivity to Change. *Stroke*, 30, 2131-2140.
- Edwards, D. F., Hahn, M. G., Baum, C. M., Perlmutter, M. S., Sheedy, C., & Dromerick, A. W. (2006). Screening Patients with Stroke for Rehabilitation Needs: Validation of the Post-Stroke Rehabilitation Guidelines. *Neurorehabilitation and Neural Repair*, 20, 42-48.
- Elliott, M. (1987). Occupational role performance and life satisfaction in elderly persons. *Occupational Therapy Journal of Research*, 7, 216-224.
- Fedoroff, J. P., Starkstein, S. E., Forrester, A. W., Geisler, F. H., Jorge, R. E., Arndt, S. V. et al. (1992). Depression in patients with acute traumatic brain injury. *American Journal of Psychiatry*, 149, 918-923.

- Feigin, V. L., Lawes, C. M., Bennett, D. A., & Anderson, C. S. (2003). Stroke epidemiology: a review of population-based studies of incidence, prevalence, and case-fatality in the late 20th century. *The Lancet Neurology*, *2*, 43-53.
- First, M., Spitzer, R., Gibbon, M., & Williams, J. (2009). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders - Non-Patient Edition (SCID-I/NP)*. New York, NY: Biometrics Research, New York State Psychiatric Institute.
- Foulkes, M. A., Wolf, P. A., Price, T. R., Mohr, J. P., & Hier, D. B. (1988). The Stroke Data Bank: design, methods, and baseline characteristics. *Stroke*, *19*, 547-554.
- Giaquinto, G. (2003). Comorbidity in post-stroke rehabilitation. *European Journal of Neurology*, *10*, 235-238.
- Green, S. B. (1991). How Many Subjects Does It Take To Do A Regression Analysis? *Multivariate Behavioral Research*, *26*, 499-510.
- Gum, A., Snyder, C. R., & Duncan, P. W. (2006). Hopeful thinking, participation, and depressive symptoms three months after stroke. *Psychology & Health*, *21*, 319-334.
- Hachinski, V. & Norris, J. (1985). *The acute stroke*. Toronto: FA Davis Company.
- Hafsreinsdottir, T. & Grypdonck, M. (1997). Being a stroke patient: A review of the literature. *Journal of Advanced Nursing*, *26*, 580-588.

- Hartman-Maeir, A., Soroker, N., Ring, H., Katz, N., & Avni, N. (2007). Activities, participation and satisfaction one-year post stroke. *Disability & Rehabilitation*, 29, 559-566.
- Harwood, R. H. (1997). Determinants of handicap 1 and 3 years after a stroke. *Disability & Rehabilitation*, 19, 205-211.
- Harwood, R. H., Prince, M. J., Mann, A. H., & Ebrahim, S. H. A. H. (1998). The prevalence of diagnoses, impairments, disabilities and handicaps in a population of elderly people living in a defined geographical area: the Gospel Oak project. *Age and Ageing*, 27, 707-714.
- Heart and Stroke Foundation of Canada (2007). Stroke statistics.
<http://www.heartandstroke.ca> [On-line]. Available: <http://www.heartandstroke.ca>
- Hill, C. (1997). Biographical disruption, narrative and identity in stroke: personal experience in acquired chronic illness. *Auto/Biography*, 5, 131-144.
- Hsu, H. C. (2005). Gender Disparity of Successful Aging in Taiwan. *Women & Health*, 42, 1-21.
- Jorge, R. E., Robinson, R. G., & Arndt, S. V. (1993). Depression following traumatic brain injury: a 1 year longitudinal study. *Journal of Affective Disorders*, 27, 233-243.
- Katz, N. (2003). Participation in occupational performance: Reliability and validity of the Activity Card Sort. *Occupational Therapy International*, 23, 10-17.

- Kelly-Hayes, M., Wolf, P. A., Kase, C. S., Gresham, G. E., Kannel, W. B., & D'Agostino, R. B. (1989). Time Course of Functional Recovery After Stroke: The Framingham Study. *Neurorehabilitation and Neural Repair*, 3, 65-70.
- Kirchman, M. (1986). Measuring the quality of life. *Occupational Therapy Journal of Research*, 6, 21-32.
- Koplas, P. A. (1999). Quality of life and Parkinson's disease. *Journal of Gerontology*, 54, 197-202.
- Langhorne, P. (2002). What are the components of effective stroke unit care? *Age Ageing*, 31, 365-371.
- Lau, A. L. D. (1998). Self-perceived quality of life of Chinese elderly people in Hong Kong. *Occupational Therapy International*, 5, 118-139.
- Legg, L. (2004). Rehabilitation therapy services for stroke patients living at home: Systematic review of randomised trials. *Lancet*, 363, 352-356.
- Levasseur, M., Desrosiers, J., & Noreau, L. (2004). Is social participation associated with quality of life of older adults with physical disabilities? *Disability and Rehabilitation: An International, Multidisciplinary Journal*, 26, 1206-1213.
- Lincoln, N. B., Walker, M. F., Dixon, A., & Knights, P. (2004). Evaluation of a multiprofessional community stroke team: A randomized controlled trial. *Clinical Rehabilitation*, 18, 40-47.

- Lui, M., Domen, K., & Chino, M. (1997). Comorbidity measures for stroke outcome research: a preliminary study. *Archives of Physical Medicine and Rehabilitation*, 78, 166-172.
- Maguire, G. H. (1983). An exploratory study of the relationship of valued activities to the life satisfaction of elderly persons. *Occupational Therapy Journal of Research*, 3, 164-172.
- Mayo, N., Wood-Dauphinee, S., Ahmed, S., Gordon, C., Higgs, C., McEwan, S. et al. (1999). Disablement following stroke. *Disability and Rehabilitation*, 21, 258-268.
- Mayo, N., Wood-Dauphinee, S., Côté, R., Durcam, L., & Carleton, J. (2002). Activity, participation, and quality of life 6 months poststroke. *Archives of Physical Medicine and Rehabilitation*, 83, 1035-1042.
- Morris, P., Robinson, R. G., Raphael, B., & Bishop, D. (1991). The relationship between the perception of social support and post-stroke depression in hospitalized patients. *Psychiatry*, 54, 306-316.
- Murray, C. J. & Lopez, A. D. (1997). Mortality by cause for eight regions of the world: Global Burden of Disease Study. *Lancet*, 349, 1269-1276.
- National Institutes of Health (1993). *Research plan for the National Center for Medical Rehabilitation Research*. Bethesda, MD: U.S. Dept. of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Child Health and Human Development.

- Osberg, J. S. (1987). Life satisfaction and quality of life among disabled elderly adults. *Journal of Gerontology, 42*, 228-230.
- Osbourne, J. & Waters, E. (2002). Four assumptions of multiple regression researchers should already test. *Practical Assessment, Research & Evaluation, 8*.
- Paradiso, S. & Robinson, R. G. (1998). Gender Differences in Poststroke Depression. *Journal of Neuropsychiatry and Clinical Neurosciences, 10*, 41-47.
- Patrick, D. L. (2000). Functional status and perceived quality of life in adults with and without chronic conditions. *Journal of Clinical Epidemiology, 53*, 779-785.
- Prince, M. J. (1997). Social support deficits, loneliness and life events as risk factors for depression in old age. *Psychological Medicine, 27*, 323-332.
- Radomski, M. (1995). There is more to life than putting on your pants. *American Journal of Occupational Therapy, 49*, 487-490.
- Rinkel, G. J., van Gijn, J., & Wijdicks, E. F. (1993). Subarachnoid hemorrhage without detectable aneurysm: A review of the causes. *Stroke, 24*, 1403-1409.
- Robinson, R. G. (2003). Poststroke depression: Prevalence, diagnosis, treatment, and disease progression. *Biological Psychiatry, 54*, 376-387.
- Rochette, A. (2001). Association between personal environmental factors and the occurrence of handicap situations following a stroke. *Disability & Rehabilitation, 23*, 559-569.

- Romero, J. R., Morris, J., & Pikula, A. (2008). Stroke prevention: Modifying risk factors. *Therapeutic Advances in Cardiovascular Disease, 2*, 287-303.
- Sarti, C., Rastenyte, D., Cepaitis, Z., & Tuomilehto, J. (2000). International Trends in Mortality From Stroke, 1968 to 1994. *Stroke, 31*, 1588-1601.
- Schleifer, S. J. & Ari-Hinson, M. M. (1989). The Nature and Course of Depression Following Myocardial Infarction. *Archives of Internal Medicine, 149*, 1785-1789.
- Schramke, C., Stowe, R., Ratcliff, G., Goldstein, G., & Condray, R. (1998). Post-stroke depression and anxiety: Different assessment methods result in variations in incidence and severity estimates. *Journal of Clinical and Experimental Neuropsychology, 20*, 723-737.
- Sharpe, M., Hawton, K., Seagroatt, V., Bamford, J., House, A., Molyneux, A. et al. (1994). Depressive disorders in long-term survivors of stroke. Associations with demographic and social factors, functional status, and brain lesion volume. *The British Journal of Psychiatry, 164*, 380-386.
- Smith, N. (1986). The relationships between volition, activity pattern and life satisfaction in the elderly. *American Journal of Occupational Therapy, 40*, 278-283.
- Stone, S. D. (2005). Reactions to invisible disability: The experiences of young women survivors of hemorrhagic stroke. *Disability & Rehabilitation, 27*, 293-304.
- Sveen, U. (2004). Well-being and instrumental activities of daily living after stroke. *Clinical Rehabilitation, 18*, 267-274.

- Travella, J., Forrester, A., Schultz, S., & Robinson, R. G. (1994). Depression following myocardial infarction: a one year longitudinal study. *International Journal of Psychiatry in Medicine*, 24, 357-369.
- Tyson, S. & Turner, G. (2000). Discharge and follow-up for people with stroke: what happens and why. *Clinical Rehabilitation*, 14, 381-392.
- Wachelder, E. M., Moulaert, V. R. M. P., van Heugten, C., Verbunt, J. A., Bekkers, S. C. A. M., & Wade, D. T. (2009). Life after survival: Long-term daily functioning and quality of life after an out-of-hospital cardiac arrest. *Resuscitation*, 80, 517-522.
- Wade, D. T., Legh-Smith, J., & Hewer, R. (1987). Depressed mood after stroke. A community study of its frequency. *British Journal of Psychiatry*, 151, 200-205.
- WHO (1998). *The world health report: Life in the 21st century: a vision for all*. Geneva: WHO.
- WHO (2000). *The world health report 2000: Health systems - improving performance*. Geneva: WHO.
- Wiles, R., Ashburn, A., Payne, S., & Murphy, C. (2002). Patients' expectations of recovery following stroke: a qualitative study. *Disability & Rehabilitation*, 24, 841-850.
- Wiles, R., Ashburn, A., Payne, S., & Murphy, C. (2004). Discharge from physiotherapy following stroke: the management of disappointment. *Social Science & Medicine*, 59, 1263-1273.

- Wilkie, R., Peat, G., Thomas, E., & Croft, P. (2006). The prevalence of person-perceived participation restriction in community-dwelling older adults. *Quality of Life Research, 15*, 1471-1479.
- Wilkie, R., Thomas, E., Mottram, S., Peat, G., & Croft, P. (2008). Onset and persistence of person-perceived participation restriction in older adults: a 3-year follow-up study in the general population. *Health and Quality of Life Outcomes, 6*, 92.
- Williams, J., Gibbon, M., First, M., Spitzer, R., Davies, M., Borus, J. et al. (1992). The Structured Clinical Interview for DSM-III-R (SCID). II. Multisite test-retest reliability. *Archives of General Psychiatry, 49*, 630-636.

Appendix A

Brief Version Mini-Mental State Exam (MMSE)

Orientation

What is the

- 1- Year
- 2- Season
- 3- Date
- 4- Day of the week
- 5- Month

Give one point for each correct answer.

___5

Where are we ?

- 1- Country
- 2- Province
- 3- City
- 4- Building
- 5- Your present address

Give one point for each correct answer.

___5

Name 3 objects : LEMON, KEY, BALL.

Take 1 second to say each word.

Ask subject to spell WORLD backwards.

Give one point for each correct letter in the right order. _____5

Recall

Ask the subject to repeat the 3 objects previously mentioned : LEMON, KEY, BALL.

Give one point for each correct response. _____3

Appendix B

Stroke Impact Scale – Participation Domain - Version 3.0

The following questions are about how stroke has affected your ability to participate in the activities that you usually do, things that are meaningful to you and help you to find purpose in life.

8. During the past 4 weeks, how much of the time have you been limited in...	None of the time	A little of the time	Some of the time	Most of the time	All of the time
a. Your work (paid, voluntary or other)	5	4	3	2	1
b. Your social activities?	5	4	3	2	1
c. Quiet recreation (crafts, reading)?	5	4	3	2	1
d. Active recreation (sports, outings, travel)?	5	4	3	2	1
e. Your role as a family member and/or friend?	5	4	3	2	1
f. Your participation in spiritual or religious activities?	5	4	3	2	1
g. Your ability to control your life as you wish?	5	4	3	2	1
h. Your ability to help others?	5	4	3	2	1

Appendix C

Stroke Specific Geriatric Depression Scale (SS-GDS)

Please circle yes or no for each question.

- | | |
|----------|--|
| YES / NO | 1. Do you feel full of energy? |
| YES / NO | 2. Do you often get bored? |
| YES / NO | 3. Do you think that most people are better off than you are? |
| YES / NO | 4. Do you frequently get upset over little things? |
| YES / NO | 5. Do you have trouble concentrating? |
| YES / NO | 6. Do you often get restless and fidgety? |
| YES / NO | 7. Are you basically satisfied with your life? |
| YES / NO | 8. Are you bothered by thoughts you can't get out of your head? |
| YES / NO | 9. Do you frequently feel like crying? |
| YES / NO | 10. Do you feel that your life is empty? |
| YES / NO | 11. Are you afraid that something bad is going to happen to you? |
| YES / NO | 12. Do you enjoy getting up in the morning? |
| YES / NO | 13. Do you often feel helpless? |
| YES / NO | 14. Do you think it is wonderful to be alive now? |
| YES / NO | 15. Do you worry a lot about the past? |
| YES / NO | 16. Are you in good spirits most of the time? |
| YES / NO | 17. Are you hopeful about the future? |

Appendix D

Geriatric Depression Scale (GDS)

Please circle yes or no for each question.

- YES/NO 1. Are you basically satisfied with your life?
- YES/NO 2. Have you dropped many of your activities and interests?
- YES/NO 3. Do you feel that your life is empty?
- YES/NO 4. Do you often get bored?
- YES/NO 5. Are you hopeful about the future?
- YES/NO 6. Are you bothered by thoughts you can't get out of your head?
- YES/NO 7. Are you in good spirits most of the time?
- YES/NO 8. Are you afraid that something bad is going to happen to you?
- YES/NO 9. Do you feel happy most of the time?
- YES/NO 10. Do you often feel helpless?
- YES/NO 11. Do you often get restless and fidgety?
- YES/NO 12. Do you prefer to stay at home, rather than going out and doing new things?
- YES/NO 13. Do you frequently worry about the future?
- YES/NO 14. Do you feel that you have more problems with memory than most?
- YES/NO 15. Do you think it is wonderful to be alive now?
- YES/NO 16. Do you often feel downhearted and blue?

- YES/NO 17. Do you feel pretty worthless the way you are now?
- YES/NO 18. Do you worry a lot about the past?
- YES/NO 19. Do you find life very exciting?
- YES/NO 20. Is it hard for you to get started on new projects?
- YES/NO 21. Do you feel full of energy?
- YES/NO 22. Do you feel that your situation is hopeless?
- YES/NO 23. Do you think that most people are better off than you are?
- YES/NO 24. Do you frequently get upset over little things?
- YES/NO 25. Do you frequently feel like crying?
- YES/NO 26. Do you have trouble concentrating?
- YES/NO 27. Do you enjoy getting up in the morning?
- YES/NO 28. Do you prefer to avoid social gatherings?
- YES/NO 29. Is it easy for you to make decisions?
- YES/NO 30. Is your mind as clear as it used to be?

Appendix E

Barthel Index

1. If there was no one to help you with your feeding, could you do it alone?
(unable = 0; needs assistance = 5; fully independent = 10)

2. If there was no one to help you with your personal hygiene, could you do it alone?
(unable = 0; needs assistance = 0; fully independent = 5)

3. If there was no one to help you, would you be able to bathe or shower without anyone present? (unable = 0; needs assistance = 0; fully independent = 5)

4. If there was no one to help you, would you be able to dress yourself?
(unable = 0; needs assistance = 5; fully independent = 10)

5. If there was no one to help you, would you be able to get to the toilet on your own?
(unable = 0; needs assistance = 5; fully independent = 10)

6. Do you have any trouble with bowel incontinence?
(complete = 0; occasional accident = 5; complete control day and night = 10)

7. Do you have any trouble with bladder control?
(complete = 0; occasional accident = 5; complete control day and night = 10)

8. Can you transfer from bed to chair independently?
(unable = 0; needs assistance = 10; fully independent = 15)

9. Can you walk 50 yards without help or supervision?
(unable = 0; needs assistance = 10; fully independent = 15)

10. Can you go up and down stairs independently?
(unable = 0; needs assistance = 5; fully independent = 10)

Evaluate only if patient is unable to walk:

11. Do you use a wheelchair?
(unable = 0; needs assistance = 0; fully independent = 10)

Total _____

Appendix F

History of depression using the Structured Clinical Interview for the Diagnosis of DSM-IV Axis I Disorders (SCID)

SCID-I (for DSM-IV-TR)	Past MDE (APR 2005)	Mood Episodes A. 12
<p>*PAST MAJOR DEPRESSIVE EPISODE*</p> <p>→ IF NOT CURRENTLY DEPRESSED: Have you <u>ever</u> had a period when you were feeling depressed or down most of the day nearly every day? (What was that like?)</p> <p>→ IF CURRENTLY DEPRESSED BUT FULL CRITERIA ARE NOT MET, SCREEN FOR PAST MDE: Has there ever been <u>another</u> time when you were depressed or down most of the day nearly every day? (What was that like?)</p> <p>IF YES: When was that? How long did it last? (As long as two weeks?)</p> <p>→ IF PAST DEPRESSED MOOD: During that time, did you lose interest or pleasure in things you usually enjoyed? (What was that like?)</p> <p>→ IF NO PAST DEPRESSED MOOD: What about a time when you lost interest or pleasure in things you usually enjoyed? (What was that like?)</p> <p>IF YES: When was that? Was it nearly every day? How long did it last? (As long as two weeks?)</p> <p>Have you had more than one time like that? (Which time was the worst?)</p> <p>IF UNCLEAR: Have you had any times like that in the past year?</p>	<p>MDE CRITERIA</p> <p>A. Five or more of the following symptoms have been present during the same two-week period and represent a change from previous functioning; at least one of the symptoms was either (1) depressed mood or (2) loss of interest or pleasure.</p> <p>(1) depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful). Note: in children and adolescents, can be irritable mood.</p> <p>(2) markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated either by subjective account or observation made by others).</p> <p>NOTE: IF MORE THAN ONE PAST EPISODE IS LIKELY, SELECT THE "WORST" ONE FOR YOUR INQUIRY ABOUT A PAST MAJOR DEPRESSIVE EPISODE. HOWEVER, IF THERE WAS AN EPISODE IN THE PAST YEAR, ASK ABOUT THAT EPISODE EVEN IF IT WAS NOT THE WORST.</p>	<p>?</p> <p>1 2 3</p> <p>A52</p> <p>?</p> <p>1 2 3</p> <p>A53</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>IF NEITHER ITEM (1) NOR (2) IS CODED "3", GO TO *CURRENT MANIC EPISODE* A. 18</p> </div>
<p>?=inadequate information 1=absent or false 2=subthreshold 3=threshold or true</p>		

FOR THE FOLLOWING QUESTIONS, FOCUS ON THE WORST TWO WEEKS OF THE PAST MAJOR DEPRESSIVE EPISODE THAT YOU ARE INQUIRING ABOUT

NOTE: WHEN RATING THE FOLLOWING ITEMS, CODE "1" IF CLEARLY DIRECTLY DUE TO A GENERAL MEDICAL CONDITION, OR TO MOOD-INCONGRUENT DELUSIONS OR HALLUCINATIONS

During that (TWO WEEK PERIOD) . . .

<p>..how was your appetite? (What about compared to your usual appetite?) (Did you have to force yourself to eat?) (Eat [less/more] than usual?) (Was that nearly every day?) (Did you lose or gain any weight?) (How much?) (Were you trying to [lose/gain] weight?)</p>	<p>(3) significant weight loss when not dieting, or weight gain (e.g., a change of more than 5% of body weight in a month) or decrease or increase in appetite nearly every day.</p>	<p>? 1 2 3</p>	<p>A54</p>
	<p>Check if: <input type="checkbox"/> weight loss or decreased appetite <input type="checkbox"/> weight gain or increased appetite</p>		<p>A55 A56</p>
<p>.. how were you sleeping? (Trouble falling asleep, waking frequently, trouble staying asleep, waking too early, OR sleeping too much? How many hours a night compared to usual? Was that nearly every night?)</p>	<p>(4) insomnia or hypersomnia nearly every day</p>	<p>? 1 2 3</p>	<p>A57</p>
	<p>Check if: <input type="checkbox"/> insomnia <input type="checkbox"/> hypersomnia</p>		<p>A58 A59</p>
<p>.. were you so fidgety or restless that you were unable to sit still? (Was it so bad that other people noticed it? What did they notice? Was that nearly every day?)</p>	<p>(5) psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down)</p>	<p>? 1 2 3</p>	<p>A60</p>
	<p>Check if: <input type="checkbox"/> psychomotor agitation <input type="checkbox"/> psychomotor retardation</p>		<p>A61 A62</p>
<p>IF NO: What about the opposite -- talking or moving more slowly than is normal for you? (Was it so bad that other people noticed it? What did they notice? Was it nearly every day?)</p>			
<p>.. what was your energy like? (Tired all the time? Nearly every day?)</p>	<p>(6) fatigue or loss of energy nearly every day</p>	<p>? 1 2 3</p>	<p>A63</p>

?=inadequate information

1=absent or false

2=subthreshold

3=threshold or true

During that time . . .

. . . how did you feel about yourself?
(Worthless?) (Nearly every day?)

(7) feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick)

? 1 2 3

A64

IF NO: What about feeling guilty about things you had done or not done? (Nearly every day?)

NOTE: CODE "1" OR "2" FOR LOW SELF-ESTEEM BUT NOT WORTHLESSNESS

Check if:

worthlessness
 inappropriate guilt

A65
A66

. . . did you have trouble thinking or concentrating? (What kinds of things did it interfere with?) (Nearly every day?)

(8) diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others)

? 1 2 3

A67

IF NO: Was it hard to make decisions about everyday things? (Nearly every day?)

Check if:

diminished ability to think
 indecisiveness

A68
A69

. . . were things so bad that you were thinking a lot about death or that you would be better off dead? What about thinking of hurting yourself?

(9) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide

? 1 2 3

A70

IF YES: Did you do anything to hurt yourself?

NOTE: CODE "1" FOR SELF-MUTILATION W/O SUICIDAL INTENT

Check if:

thoughts of own death
 suicidal ideation
 specific plan
 suicide attempt

A71
A72
A73
A74

?=inadequate information

1=absent or false

2=subthreshold

3=threshold or true

AT LEAST FIVE OF THE ABOVE SXS [A(1-9)] ARE CODED "3" AND AT LEAST ONE OF THESE IS ITEM (1) OR (2)

1

3

A75

IF NOT ALREADY ASKED: Has there been any other time when you were (depressed/OWN WORDS) and had even more of the symptoms that I just asked you about?

CONTINUE WITH NEXT ITEM, CRITERION C, MIDDLE OF PAGE

IF YES: RETURN TO *PAST MAJOR DEPRESSIVE EPISODE,* A. 12, AND CHECK WHETHER THERE HAVE BEEN ANY OTHER MAJOR DEPRESSIVE EPISODES THAT WERE MORE SEVERE AND/OR CAUSED MORE SYMPTOMS. IF SO, ASK ABOUT THAT EPISODE.

IF NO: GO TO *CURRENT MANIC EPISODE,* A. 18.

NOTE: DSM-IV criterion B (i.e., does not meet criteria for a mixed episode) has been omitted from the SCID).

?

1

2

3

A76

IF UNCLEAR: Did (depressive episode/OWN WORDS) make it hard for you to do your work, take care of things at home, or get along with other people?

C. The symptoms cause clinically significant distress or impairment in social, occupational or other important areas of functioning.

IF NOT ALREADY ASKED: Has there been any other time when you were (depressed/OWN WORDS) and it caused even more problems than the time I just asked you about?

CONTINUE ON NEXT PAGE

IF YES: RETURN TO *PAST MAJOR DEPRESSIVE EPISODE,* A. 12, AND CHECK WHETHER THERE HAVE BEEN ANY OTHER MAJOR DEPRESSIVE EPISODES THAT WERE MORE SEVERE AND/OR CAUSED MORE SYMPTOMS. IF SO, ASK ABOUT THAT EPISODE

IF NO: GO TO *CURRENT MANIC EPISODE,* A. 18.

?=inadequate information

1=absent or false

2=subthreshold

3=threshold or true

Just before this began, were you physically ill?

IF YES: What did the doctor say

Just before this began, were you using any medications?

IF YES: Any change in the amount you were using?

Just before this began, were you drinking or using any street drugs?

D. The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, medication) or to a general medical condition (e.g., hypothyroidism)

? 1 3

DUE TO SUBSTANCE USE OR GMC

IF THERE IS ANY INDICATION THAT THE DEPRESSION MAY BE SECONDARY (I.E., A DIRECT PHYSIOLOGICAL CONSEQUENCE OF A GMC OR SUBSTANCE, GO TO *GMC/ SUBSTANCE,* A. 43, AND RETURN HERE TO MAKE A RATING OF "1" OR "3."

REFER TO LIST OF GENERAL MEDICAL CONDITIONS AND SUBSTANCES, A. 4.

IF UNKNOWN: Has there been any other time when you were (depressed / OWN WORDS) like this but were not (using SUBSTANCE / ill with GMC)?

PRIMARY MOOD EPISODE

IF YES: GO TO *PAST MAJOR DEPRESSIVE EPISODE,* A. 12 AND CHECK WHETHER THERE HAS BEEN ANY OTHER MAJOR DEPRESSIVE EPISODE NOT DUE TO A SUBSTANCE OR GENERAL MEDICAL CONDITION. IF SO, ASK ABOUT THAT EPISODE.

IF NO: GO TO *CURRENT MANIC EPISODE,* A. 18

CONTINUE ON NEXT PAGE

?=inadequate information

1=absent or false

2=subthreshold

3=threshold or true

Appendix G

DSM-IV Criteria for History of Depression

A) Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure

Note: Do not include symptoms that are clearly due to a general medical condition, or mood-incongruent delusions or hallucinations

1) depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful).

Note: In children and adolescents, can be irritable mood.

2) markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation made by others)

3) significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day.

Note: In children, consider failure to make expected weight gains.

4) insomnia or hypersomnia nearly every day

5) psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down)

6) fatigue or loss of energy nearly every day

7) feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick)

8) diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others)

9) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide

B) The symptoms do not meet criteria for a Mixed Episode

C) The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

D) The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., hypothyroidism)

E) The symptoms are not better accounted for by Bereavement, i.e., after the loss of a loved one, the symptoms persist for longer than 2 months or are characterized by marked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, or psychomotor retardation.

Appendix H

Co-morbid Conditions Checklist

Please indicate whether you are presently treated for each of the identified conditions.

- | | |
|-----------------------|--|
| (1) Hypertension | (14) Impaired hearing |
| | (15) Parkinson's disease |
| (2) Heart attack (MI) | (16) Thyroid problem |
| (3) Angina | (17) Cancer (specify type,
Location)_____ |
| (4) Stroke | (18) Liver disease |
| (5) Hemiplegia | (19) Other, specify,_____ |
| (6) Bronchitis | |
| (7) Emphesema | |
| (8) Asthma | |
| (9) Arthritis | |
| (10) Ulcer disease | |
| (11) Diabetes | |
| (12) Glaucoma | |
| (13) Cataracts | |

Appendix I

Canadian Neurological Scale (CNS)

Section A – Mentation For Drowsy or Alert Patients

1) LEVEL OF CONSCIOUSNESS

3 = alert 1.5 = drowsy

2) ORIENTATION

1 = oriented 0 = disoriented or non-applicable

3) SPEECH

1 = normal 0.5 = expressive deficit 0 = receptive deficit

Total Score A _____ /5

Section A1 - No Receptive Deficit

Section A2 - Receptive Deficit

MOTOR

4) FACE

0.5 = none
0 = present

4) FACE

0.5 = symmetrical
0 = asymmetrical

5) ARM PROXIMAL

1.5 = none
1.0 = mild
0.5 = significant
0 = total

5) ARMS

1.5 = equal
0 = unequal

6) ARM DISTAL

- 1.5 = none
- 1.0 = mild
- 0.5 = significant
- 0 = total

6) LEGS

- 1.5 = equal
- 0 = unequal

7) LEG PROXIMAL

- 1.5 = none
- 1.0 = mild
- 0.5 = significant
- 0 = total

8) LEG DISTAL

- 1.5 = none
- 1.0 = mild
- 0.5 = significant
- 0 = total

Total Score A1 _____ /6.5

Total Score A2 _____ /3.5

Total Score A + A1 _____ /11.5

Appendix J

Patient Information and Consent Form

INVESTIGATORS: Nancy E. Mayo PhD, Sydney Miller PhD, Lesley Fellows MD
FRCP, Lisa Koski PhD, Ronald Ludman MD, Rosa Sourial MSc, Robert Côté MD
FRCP.

SPONSOR: Heart and Stroke Foundation of Quebec

PROJECT COORDINATOR: Lois Finch MSc

Introduction

We are a group of researchers associated with McGill and Concordia Universities and the McGill University Health Center (MUHC) who are evaluating the recovery process after stroke. One of the effects of stroke can be on a person's mental state causing depressive symptoms such as: feelings of the blues or sadness, loneliness, sleep problems, loss of appetite and discouragement. It is important to understand these changes after stroke because they affect recovery and can interfere with family and social life. In addition, some changes may require further evaluation and treatment. Our interest is in how these symptoms may start, come and go, stop or continue; this is what is meant by the term "dynamics". The aim of this proposed study is to identify the various patterns of depressive symptoms post-stroke.

As you have recently had a stroke, we are requesting your participation in this project. Before agreeing to participate, it is important that you read and understand the procedures, advantages and disadvantages of this study.

What is involved?

If you agree to participate, a trained member of our research team will assess you while you are in the hospital before you leave. They will see how you move your hands, arms and legs, balance, think and how well you can do activities like walking and climbing stairs. We will also ask you questions about your ability to do basic activities and about your memory, thinking and mood. In addition to these evaluations, we need to obtain some basic information, from your medical chart, about your medical history, your care and your stroke. In addition, an observer will record your activities, your location and the persons present with you from 8 am to 6 pm on two different days. We will also ask your therapists to record the activities they did with you during your therapy sessions.

After leaving the hospital, we will call you every two weeks to ask how you are doing. If you are in a rehabilitation hospital, we will visit or telephone you. Each of these calls will take no more than 10 minutes and, over the next 12 months, we will call you 20 times.

In addition, every 3-months over the next year, we will repeat the tests and questionnaires for a total of 5 full assessments. Each assessment will take about 1.5 hours and will take place at our specially equipped research room at the Royal Victoria Hospital. During the assessment, we will make sure you are comfortable and have drinks and snacks and rest periods.

If any of these assessments indicate that you need treatment for the symptoms you are experiencing, we will refer you to one of the doctors working with us for treatment.

Compensation

You will not be paid to participate in this research study. You will not have to pay for transportation. If someone can drive you, we will pay for parking, if not we can arrange for a driver to pick you up and take you home. If you cannot come because you live too far away or do not feel well enough, we can come to your home.

Advantages

While participating is unlikely to benefit you directly, the information we gather will help us understand mood changes after stroke and will help us plan the best care for future stroke patients.

Disadvantages

There are no serious risks involved in participating. Sometimes answering questions about feelings and experiences makes people uncomfortable. You may skip any questions that make you feel uncomfortable. All evaluations will be supervised so that if you require physical assistance to ensure your safety, it will be provided.

Confidentiality

All of the information we gather from you will be kept strictly confidential and locked in a filing cabinet. The data collected from the tests and questionnaires will be put in a computer and you will be identified only by a number, your name will not be on the forms. The data will be used to make statistical summaries and will be included in reports

published in medical journals. You will not be identified in any of these reports. In the future, the information we gather may be used by other researchers to answer additional research questions about stroke. If you wish and agree, we can share the results of the assessments with your doctors. To make sure this study follows the rules concerning research, a member of one of the MUHC-Research ethics Boards may contact you and /or review your research files.

Voluntary participation/withdrawal from study

Your participation in this research study is strictly voluntary. You can refuse to participate or withdraw from this study at any time, for any reason, without explanation, without penalty or loss of any benefits to which you are entitled. If you decide not to participate or withdraw it will not affect your present or future medical care. Participation in this study will not affect your participation in any other study. Any new important information discovered during the study that may influence your willingness to continue participating in the study will be made available to you.

Contacts

If you have any questions about this study, please contact the principle investigator Dr Nancy Mayo at 514-934-1934 ext 36909 or the research coordinator Lois Finch at (514) 934-1934, extension 36906. If you have any questions about being a research subject, your rights and/or research related injuries you may contact the complaints commissioner/ombudsman at (514)-934-1934, extension 35633

Declaration of consent

I, _____, have read the above description with one of the investigators, _____. I fully understand what is involved, the benefits and risks of the study, which have been explained to me and all my questions have been answered satisfactorily. I freely and voluntarily consent to participate in this study. By signing this consent form, I have not given up any of my legal rights.

A copy of this consent form has been given to the person named below.

Participant: NAME (print) Signature Date: MM/DD/YYYY

Person obtaining consent:NAME (print) Signature Date: MM/DD/YYYY

Investigator: Name (print) Signature Date: MM/DD/YYYY