Enabling Participation in Older Adults with Stroke: An Occupational Performance Model

Erin Henshaw
Doctoral Candidate
Washington University School of Medicine
Program in Occupational Therapy

I. Introduction

A stroke is a debilitating cardiovascular disease and a leading cause of long-term disability in industrialized societies. Nearly 700,000 people suffer a stroke each year and approximately 200,000 of these are recurrent attacks (American Stroke Association, 2007). Stroke is considered a leading cause of mortality as it ranks third among all causes of death behind heart disease and cancer (American Stroke Association, 2007). Deficits associated with stroke are costly in terms of disability and burden to society, with direct and indirect estimated to reach $62.7 billion in 2007 (American Stroke Association). The impact of stroke on functional recovery is also quite significant with a large percentage of stroke survivors remaining permanently disabled and many others requiring institutional care in the months following their stroke (Kelly-Hayes et al., 2003).

The World Health Organization broadly defines stroke as “rapidly developing clinical signs of focal or global disturbance of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin” (WHO MONICA Project, 1990). More specifically, a stroke can be classified into two general types: Ischemic and hemorrhagic. Approximately 80% of all strokes are ischemic (American Stroke Association, 2006). Ischemia refers to a disruption of the blood supply to an area of the brain, which eliminates its supply of glucose and oxygen resulting in an infarct, or area of dead tissue (American Stroke Association, 2006; Barker-Collo & Feigin, 2006). Approximately 50% of ischemic strokes are caused by cerebral thrombosis, which is when a plug forms inside an artery blocking blood flow (Barker-Collo & Feigin, 2006; Sacco, 2005). In contrast to thrombotic strokes, blood flow can also be blocked by an embolism, where a plug of thrombic material travels through arteries and eventually lodges in a blood vessel that is too small for it to pass through (American Stroke Association; Sacco, 2005). Approximately 30% of ischemic strokes are caused by cerebral embolism (Barker-Collo & Feigin).

Hemorrhagic stroke, which accounts for approximately 20% of all strokes, may be due to intracerebral hemorrhage or subarachnoid hemorrhage (American Stroke Association, 2006). An
intracerebral hemorrhage (also called a parenchymal hemorrhage) occurs when a diseased artery within the brain ruptures, flooding the surrounding brain tissue with blood (Barker-Collo & Feigin, 2006; Sacco, 2005). The major risk factor for intracerebral hemorrhage is hypertension (American Stroke Association, 2006; Barker-Collo & Feigin, 2006; Michael & Shaughnessy, 2006). Most signs and symptoms associated with intracerebral hemorrhage are caused by the compression of brain structures and blood vessels (Barker-Collo & Feigin). Subarachnoid hemorrhage refers to bleeding into the skull or cranium that occurs when a blood vessel on the surface of the brain ruptures and bleeds into the meninges (Sacco, 2005). Subarachnoid hemorrhage usually follows the rupture of an aneurysm or arteriovenous malformation (Sacco).

With the rapid aging of the population, stroke remains a serious concern as age is the single most important risk factor for stroke and nearly ¾ of all strokes occur in individuals older than 65 years (Michael & Shaughnessy, 2006). With the older adult population, it is important to recognize that the clinical and functional consequences of stroke can be compounded by concurrent conditions associated with aging. However, stroke is not an inevitable consequence of aging. By identifying and modifying risk factors in older individuals, there are opportunities to reduce the incidence and mortality of stroke in this population (Michael & Shaughnessy, 2006).

The clinical presentation of stroke symptoms varies depending on lesion location and the degree of cellular damage (Sacco, 2005; Woodson, 2002). In addition, stroke impact depends on the specific combination of intrinsic features as well as environmental or contextual factors (American Stroke Association, 2006; Sacco, 2005). Despite the individualized nature of stroke, there are common trends reported in the literature regarding factors commonly affected. Intrinsic factors impacted by stroke can be classified into categories and include cognitive, psychological, physiological, motor, sensory, and spiritual domains (Woodson, 2002). Key environmental factors include social support, social capital, culture, physical environment, technology, and policy. The following paper comprehensively explores the above factors to convey the complex and significant impact of stroke on the everyday lives of older adults.

II. Occupations of Older Adults

Occupational therapy is a profession founded on a belief in the fundamental importance of occupation (American Occupational Therapy Association, 1995). Engagement in occupation is assumed to be an essential part of living and to have the potential to influence health and well-being (Polatajko, 1992; Yerxa, 1993). Although occupational engagement is important throughout the lifespan, recent literature has
emphasized the importance of activity participation in older adults, a group representing an increasingly large proportion of both the general population and occupational therapy clientele (Carlson, Fanchiang, Zemke, and Clark, 1996). According to Bassuk & Colleagues (1999), as social connections and participation in social activities decline, older adults are at increased risk for cognitive decline. Others have similarly found that intellectual engagement through participation in everyday activities buffers individuals against cognitive and physical decline in later life (Glass et al., 1995; Gregory, 1983; Horgas, Wilms, & Baltes, 1998; Hultsch, Hertzog, Small, & Dixon, 1999). Older adult activity participation has also been shown to expand social networks and facilitate contact with persons of like interest, as well as improve one’s quality of life and sense of identity (Rudman, Cook, & Polatajko, 1997; Unger, Johnson, & Marks, 1997).

Daily activities of older adults can vary greatly according to individual interests and life circumstances. According to Bonder & Goodman (2002), some older adults engage in many activities, and others focus on one or two. Moreover, some older adults report activities that are related primarily to family, while others may be active in volunteer work, hobbies, social relationships, and care of personal needs (Bonder & Goodman, 2002). Many older adults are also affected by changes in life roles as they age. Some individuals must end previous roles or add existing roles to their life in response to changes in their home or family dynamics. For example, the death of a loved one dramatically shifts occupational tasks and many older adults find that they must modify their roles to accommodate them. In addition to role changes and occupational preferences, activity participation can also be influenced by personal factors such as age, gender, marital status, life satisfaction, and residential status, as shown by Horgas et al. (1998) and Smith, Kielhofner, & Watts (1986). Of these factors, Horgas & Colleagues found that age and long-term care residence were the most influential barriers to how older adults conducted daily life. More specifically, it was found that elders older than age 90 showed significantly less activity engagement than their younger peers in all daily activities except resting. In terms of residential status, participants in long-term care housing did fewer IADL tasks and performed leisure activities less often and for shorter times throughout the day. Long-term care residents also rested more frequently and for longer periods than their community-dwelling peers. Smith & Colleagues (1986) found that older adults with high life satisfaction spent more time in recreation and work activities, while individuals with low life satisfaction spent more time in rest and daily living tasks.

Despite the individualized nature of occupation for older adults, studies have attempted to describe the primary activities that occupy older adults’ time. Horgas & Colleagues (1998) found that older adults
participate in three main activity categories: obligatory activities (personal self-care and Instrumental Activities of Daily Living [IADLs]), leisure activities (television viewing, reading, etc.), and resting. The daily distribution of these activities was found to depend on frequency and duration. While self-care and IADLs were found to occur most frequently, leisure activities occupied the most time throughout the day. The importance of leisure pursuits was also identified by Smith & Colleagues (1986), who found that recreation activities occupied one of the largest percentages of older adults' time (27%). The study also recognized work as an occupation of older adults, although this category represented only a small percent of participants’ everyday life (6%). The finding that older adults participate in work is supported by Bonder & Goodman (2002), who report that some older adults are creating a trend to earlier retirement followed by a second career in a different area, a return to part-time work, or a move to volunteer work.

Assessment of occupation in older adult populations is an important component of client-centered practice. The Activity Card Sort (ACS) is a great measurement tool for determining activities the client presently participates in as well as activities that he/she has given up (Baum, 1995; Baum & Edwards, 2001). Another useful assessment is the Canadian Occupational Performance Measure (COPM), a semi-structured interview that enables the client to identify occupational performance concerns and then rate those concerns according to their importance (Law et al., 1998). The COPM may also assist the client in determining functional goals for treatment. Finally, occupation is perhaps best measured by skilled observation of the client engaging in occupational performance. Such observation is important for determining points of performance breakdown that the client can ultimately address in treatment (Polatajko & Mandich, 2004).

Promoting activity participation in older adults is an important issue in contemporary occupational therapy practice. Scientific literature demonstrates that occupational engagement is important for maintaining health and well-being as well as enhancing social support and personal identity (Rudman et al., 1997; Unger et al., 1997). The literature clearly suggests that older adults do not cease to engage in occupations as they age, but rather experience a shift in their activity patterns (Horgas et al., 1998; Smith et al., 1986). With these activity shifts, older adults remain a productive sector of society with identifiable interests and occupational pursuits.

III. Cognitive Factors

Cognitive impairments are common in patients with stroke and often interfere with functional recovery and participation in daily life activities (Alladi, Meena, & Kaul, 2002). According to Katz &
Hartman-Maeir (2005), cognition is conceptualized as comprising basic cognitive skills (i.e., memory, attention, perception, etc.) as well as higher-level cognitive functions including awareness and executive processing. Knowledge of cognition has grown considerably in the past several years, particularly in the rehabilitation disciplines (Katz & Hartman-Maeir, 2005). This increase in knowledge has had important implications for the field of occupational therapy as cognitive processes are essential for enabling occupation and full community integration (Katz & Hartman-Maeir, 2005).

Several studies describe the prevalence and functional impact of basic cognitive skills in survivors of stroke (Barker-Collo & Feigin, 2006; Hochstenbach et al., 1998; Sachdev et al., 2004). In one study of 229 individuals assessed 2-months post-stroke, it was found that over 70% suffered impaired information processing and at least 40% suffered difficulties with memory, visuospatial and constructional skills, language, and arithmetic (Hochstenbach et al., 1998). Sachdev & Colleagues (2004) examined a sample of 170 stroke and transient ischemic attack (TIA) survivors at 3-6 months post-stroke in comparison to 96 age-matched controls. In the study, the factors that contributed most to differentiating impaired from unimpaired individuals were abstraction, information processing speed, working memory, and mental flexibility. At the broadest level, cognitive disability can manifest in reduced efficiency and pace of functional recovery, decreased effectiveness in performing activities of daily living, and a failure to adapt to novel or problematic situations (Fong, Chan, & Au, 2001). In addition, others report that cognitive dysfunction in stroke patients can be a source of safety concern in nearly all areas of occupational performance, with key areas including mobility, meal preparation, and medication (Hyndman & Ashburn, 2003; Woodson, 2002).

Literature has also described the presence and nature of unilateral spatial neglect in persons with stroke (Freeman, 2001; Heilman, Watson, & Valenstein, 1993; Tham, Ginsburg, Fisher, & Tegner, 2001). Unilateral spatial neglect is a cognitive deficit marked by an impaired ability to attend, respond, or orient to stimuli presented unilaterally (Giles, 1996). Studies suggest that unilateral neglect is most common after a right parietal lesion, with the incidence as high as 90% depending on the diagnostic criteria used (Cooke, 1992; Freeman, 2001). The manifestations of neglect may be related to a person’s own body (personal) or to a portion of extrapersonal space (Heilman, Watson, & Valenstein, 1993). Neglect has important implications for occupational therapy practice because of the functional implications of this phenomenon. Decreased attention to one side of extrapersonal space can compromise mobility, and persons with neglect often have difficulty feeding themselves and performing other self-care tasks (Kinsella & Ford, 1985). Omitting words on one side of the page when reading can lead to poor comprehension of written materials,
and the distorted perception of the world resulting from neglect can contribute to general confusion in daily life (Freeman, 2001; Kinsella & Ford, 1985).

Studies also suggest that persons with stroke frequently experience higher order cognitive deficits (Pohjasvaara et al., 2002; Vataja et al., 2003). According to Vataja & Colleagues (2003), patients with ischemic stroke show high prevalence of executive dysfunctions, especially if lesions affect the frontal-subcortical circuits. In a large study of 256 patients it was found that executive dysfunctions were prevalent in about 40% of patients 3 to 4 months post-ischemic stroke (Pohjasvaara et al., 2002). In this study, the patients were also older, had lower education, and did worse on activities of daily living (ADL) and instrumental activities of daily living. Executive dysfunction has important implications for everyday life as affected persons appear disorganized while performing complex tasks, may not initiate new activities, and may have difficulties with problem-solving, impulse control, and appropriate task shifting (Burgess, 2000; Channon & Crawford, 1999). Literature suggests that these individuals have particular difficulty with performance of complex, multi-step tasks and strategy use in open-ended situations (Burgess, 2000; Shallice & Burgess, 1991).

Self-awareness deficits are also significant in patients with stroke, and have been shown to be a serious obstacle for successful rehabilitation (Appelros, Karlsson, Seiger, & Nydevik, 2002; Hartman-Maeir, Soroker, & Katz, 2001; Hartman-Maeir, Soroker, Oman, & Katz, 2003; Hartman-Maeir, Soroker, Ring, & Katz, 2002). Patients with stroke who lack awareness of their impairments and disabilities may not be motivated to learn and use compensatory techniques in ADL (Bisiach & Geminiani, 1991; Fleming & Strong, 1995; McGlynn & Schacter, 1989). They may also insist on participating in activities that they can no longer perform, such as driving a car or activities related to work (Tham et al., 2001).

Another cognitive disorder experienced by individuals with stroke is apraxia, a disturbance in the execution of learned movements not attributed to primary motor or sensory impairments, or to deficits in comprehension, memory, or motivation (Renzi, 1989; Kolb et al., 1990; van Heugten et al., 1998). There are different types of apraxia, with common varieties including ideomotor (or limb) apraxia, conceptual (or ideational) apraxia, and buccofacial apraxia (Jacobs, 2005). Ideomotor apraxia refers to patients who make errors when asked to pantomime limb movements involving tools (Ambrosoni et al., 2006). In contrast to ideomotor apraxia, patients with conceptual apraxia have a loss of knowledge about the idea of movements (Jacobs, 2005). Such patients frequently make “content” errors regarding the associations of tools to specific actions (Jacobs, 2005). Finally, persons with buccofacial apraxia have difficulty producing skilled movements involving the lips, mouth, and tongue (Jacobs, 2005). Apraxia predicts functioning in
activities of daily living (ADL) in persons with stroke, and individuals with apraxia are reported to require more assistance with ADL than individuals with other neuropsychological impairments (Poole, 1998; Sundet et al., 1988).

Assessment of cognitive factors enables clinicians to consider the impact of cognition on occupational performance. The Short Blessed Test is a six-item measure of memory and concentration that can assist in screening for basic cognitive impairment (Katzman et al., 1983). Regarding assessment of language abilities, the Boston Diagnostic Aphasia Examination (BDAE) has several subsections that can be implemented on an individual basis to screen for specific impairments (Goodglass & Kaplan, 1983; Mack et al., 1992). Unilateral spatial neglect can be easily measured with the Mesulam Cancellation Test (Mesulam, 1986), and common assessments for higher level cognition include the Trail Making Test, Dysexecutive Questionnaire (Self-rating and Caregiver rating), and Executive Function Performance Test (Baum & Edwards, 1993; Reitan, 1992; Wilson et al., 1996). Finally, apraxia can be evaluated via the Cognitive Rehabilitation Research Group Apraxia Test, which provides a simple assessment of all three subtypes (Edwards, Baum, & Deuel, 1991).

The cognitive impact of stroke on everyday life is well-documented in the literature and has contributed to an increase in knowledge in the scientific community. With this increase in knowledge, cognitive rehabilitation has become an integral component of contemporary stroke management (Alladi, Meena, & Kaul, 2002).

IV. Psychological Factors

A stroke can lead to many changes in a person’s life, including loss of health, occupation, social role, and independence (Whyte & Mulsant, 2002). Adjusting to change can be a difficult process for many people and is an important issue faced during stroke recovery. Many psychological changes can occur during this vulnerable time, including depression, apathy, changes in self-concept, and emotional lability (The Stroke Association, 2005).

Major depression is a common occurrence following a stroke (Paul et al., 2006). According to Whyte & Mulsant (2002), the prevalence of depression varies based on the time since the injury, with the peak prevalence generally reported as 3-6 months post-stroke (Whyte & Mulsant, 2002). However, a 2006 study by Paul & Colleagues revealed that 45% of stroke survivors were still depressed at 5 years post-stroke. Such a finding suggests that depression is a chronic issue faced by persons with stroke that endures well beyond their discharge from rehabilitation.
Regarding the etiology of post-stroke depression, researchers have split into several camps supporting opposing views (Whyte & Mulsant, 2002). Some propose a primary biological mechanism according to which ischemic insults directly affect neural circuits involved in mood regulation (Beblo et al., 1999; Robinson et al., 1984; Starkstein et al., 1991), while others propose a psychosocial mechanism according to which the social and psychological stressors associated with a stroke are considered the primary cause of depression (Gainotti et al., 1999; House, 1996). However, Whyte & Mulsant (2002) argue that most post-stroke depressions are multi-factorial in origin and consistent with a bio-psychosocial model of mental illness.

Much research has examined the factors correlating with post-stroke depression. In particular, studies have shown that post-stroke depression is associated with excess disability (Herrman et al., 1998; Singh et al., 2000), poor rehabilitation outcomes (Gillen et al., 2001; Paolucci et al., 2001), decreased quality of life (Sturm et al., 2004), morbidity (Morris et al., 1992), mortality (House et al., 2001), suicidal thoughts and plans (Kishi et al., 1996; Pohjasvaara et al., 1998), and cognitive impairment (Nys et al., 2005). It has also been shown that persons high on the personality dimension of neuroticism are at increased risk of developing post-stroke depression (Aben et al., 2002).

A related psychological issue faced by persons with stroke is apathy, or the absence of lack of feeling, interest, emotion, or concern (Starkstein et al., 1993). A person with apathy may appear listless, passive, unmotivated, and lacking spontaneity and initiative (Marin et al., 1995). Apathetic symptoms can be difficult to distinguish from post-stroke depression. In some cases apathy signals depression; in other cases apathy and decreased motivation occur in the absence of depressed mood or other core symptoms of major depression (Marin et al., 1995). In a 1997 study of 40 subcortical infarction patients, Okada & Colleagues found that 50% of patients showed signs of apathy. These patients also showed significantly lower scores on verbal intelligence and frontal function tests and a significantly higher depression score than the non-apathetic group. Starkstein et al. (1993) found that stroke patients with apathy were significantly older and had more severe cognitive impairments and deficits in ADL than non-apathetic patients.

Literature also suggests that persons with stroke experience a change in self-concept following their injury (Ellis-Hill & Horn, 2000). Ellis-Hill & Horn (2000) examined the past and present self-concept of 26 first-time stroke survivors who had returned home from the hospital up to two years previously. In the study, persons with stroke largely described themselves in more negative terms than prior to their stroke. In particular, individuals described themselves as being less interested, capable, and independent than
before their stroke, and less in control, satisfied, and active. However, respondents still saw themselves as friendly, calm, caring, hopeful, and talkative (Ellis-Hill & Horn, 2000). These changes in self-concept suggest that clinicians need to be aware of the meaning of the stroke within the past, present, and future life of each individual they treat.

Emotional lability is another distressing complication in patients with stroke. Emotional lability is a condition in which there are exaggerated and rapid swings of emotion that can result in outbursts of tears, laughter, and even anger (The Stroke Association, 2005). Approximately one in every four people experiences this condition in the first six months after a stroke (The Stroke Association, 2005). Anger and frustration often emerge with the patient realizes that he/she cannot perform activities that he/she used to do before the stroke (Ghika-Schmid et al., 2000; Kim et al., 2002; Santos et al., 2006). In a 2006 study by Santos & Colleagues, anger was evaluated in 202 acute stroke patients with anger present in 71 (35%) of patients. In addition, 26 of these individuals were classified as severely angry (Santos et al., 2006). In a similar study, Kim & Colleagues (2002) demonstrated that anger and aggression were still present in 32% of patients at 3-12 months post-stroke and were strongly related to motor dysfunction, dysarthria, and lesions affecting frontal lenticulocapsular-pontine base areas.

Given the high prevalence of psychological concerns in older adults with stroke, screening is very important and should be built into clinicians’ measurement batteries. Post-stroke depression can be easily measured via the Center for Epidemiological Studies Depression Scale (CES-D), a 10-item self-rating questionnaire commonly used with adults with brain injury (Radloff, 1977). In addition, a useful tool for measuring apathy is the Apathy Evaluation Scale (AES), an assessment of symptoms that is completed by the therapist (Glenn, 2005). Regarding self-concept, an informal interview conducted with the client will enable an in depth exploration of the client’s views and self-beliefs. Finally, emotional lability can be easily screened via careful observation of the client for signs of distress and emotional outbursts.

The psychological effects of stroke are frequent and can lead to adverse outcomes in patients’ everyday lives. Clinicians must be aware of these issues when treating patients with stroke and should conduct routine screens to identify patients’ specific psychological needs.

V. Physiological Factors

Of the more than 700,000 strokes that occur each year, 200,000 are recurrent (Thom et al., 2006). Approximately 25% of people who recover from their first stroke will have another stroke within 5 years (Thom et al., 2006). Given these high numbers, it is important for health professionals to direct
interventions toward reducing patients’ risk of future stroke. Specific target areas include control of hypertension, resolution of dyslipidemia, management of diabetes, anticoagulation for atrial fibrillation (AF), cessation of cigarette smoking, and promotion of a healthy diet and exercise (Barnett, 2002). Promotion of exercise is particularly important as exercise can have a positive impact on many of the cardiovascular risk factors. As risk factors and the incidence of stroke peak in persons aged 75 years or older, strategies of demonstrated value in stroke prevention are of particular importance in the older adult population (Barnett, 2002; Michael et al., 2006).

Elevated blood pressure is a significant determinant of the long-term risk of stroke (Seshadri et al., 2006). Isolated systolic hypertension, defined as systolic blood pressure $\geq 140$ mm Hg with a diastolic blood pressure $< 90$ mm Hg, affects most individuals aged 60 years and older (Sander, 2004). Antihypertensive treatment has established efficacy in primary prevention of fatal or nonfatal stroke in hypertensive and high-risk patients older than 60 years, particularly through treatment of systolic hypertension (Andrawes et al., 2005). In a summary of 17 treatment trials of hypertension throughout the world involving nearly 50,000 patients, investigators found a 38% reduction in all stroke and a 40% reduction in fatal stroke resulting from systematic treatment of hypertension. Treatment was also highly effective in preventing stroke in individuals older than 65 years with systolic hypertension (Waebler, 2003).

Elevated cholesterol levels are not uncommon in older adults, with 61% of women aged 65 - 74 years reported to have total cholesterol levels over 240 mg/dL (Sarti et al., 2000). Elevated total cholesterol and decreased levels of high-density lipoproteins predispose older adults to ischemic stroke (Sarti et al., 2000). The mechanism through which serum cholesterol increases stroke risk is based on its action on the artery walls (Michael et al., 2006). Possible benefits from lipid-lowering therapy are particularly relevant for the older adult population at high risk for stroke (Sarti et al). To date, the largest clinical trials suggest a beneficial effect for stroke prevention with HMG-CoA reductase inhibitors (statins) in high-risk elderly subjects aged 82 years or younger (Andrawes et al., 2005). After lifestyle modifications of diet and exercise, statin agents are recommended as the first-line choice of treatment for management of dyslipidemia (NCEP, 2001).

There is an age-related increase in total body fat and visceral adiposity that often is accompanied by diabetes or impaired glucose tolerance (Michael et al., 2006). The prevalence of type II diabetes increases progressively with age, peaking at 16.5% in men and 12.8% in women at ages 75 to 84 years (Michael et al., 2006). Type II diabetes, often associated with high blood pressure, contributes to increased frequency and severity of cerebral vascular events (Bauduceau et al., 2005). The risk of macrovascular
Disease is actually increased before glucose levels reach the diagnostic threshold for diabetes, and 25% of newly diagnosed patients with diabetes already have overt cardiovascular disease (Wilson et al., 2002). Diabetes and related complications may lead to premature arterial stiffening and hypertrophy of the left ventricle, yielding a predisposition to coronary heart disease, heart failure, stroke, and other conditions (Michael et al.).

Atrial fibrillation (AF) is the most common clinically relevant dysrhythmia in persons younger than 75 years and is strongly associated with ischemic stroke and other adverse outcomes (Michael et al., 2006). It is also the most treatable cardiac precursor of stroke (Go, 2005). AF describes quivering of the upper chambers of the heart, leading to pooling of blood where clots may develop (Michael et al., 2006). The incidence and prevalence of AF have been shown to increase with age (Thom et al., 2006). Regarding treatment, multiple clinical trials have demonstrated the effectiveness of warfarin sodium anticoagulation in reducing the risk of stroke in older adults (Cooper, 2004). However, the complex pharmacokinetics and narrow therapeutic window of warfarin make its use challenging (Michael et al.).

Many of the cardiovascular risk factors associated with stroke require changes in health behaviors, such as choosing a healthier diet, losing weight, beginning an exercise program, stopping smoking, or adhering to a medication regimen (Shaughnessy et al., 2006a). Behavior change is closely associated with changing beliefs, essential to the adoption and maintenance of self care and exercise after stroke (Robinson-Smith et al., 2003; Shaughnessy et al., 2006b). After stroke, regular exercise can facilitate motor recovery and can also help control the common co-morbidities that influence recurrent stroke risk. Exercise can reduce hypertension, enhance glucose regulation, improve blood lipid profiles, and reduce body fat (Michael et al., 2006).

The role of exercise is especially significant as reduced cardiorespiratory fitness is a well-documented physical impairment in patients with chronic stroke (Bachynski-Cole et al., 1985; Kelly et al., 2003; Macko et al., 1997; Potempa et al., 1996; Potempa et al., 1995). During maximal effort exercise, patients with chronic stroke exhibit peak oxygen uptake that is less than 50% of that obtained by a healthy, age-matched population (Palmer-McLean et al., 1997; Potempa et al., 1995). Differences are also seen during sub-maximal exercise, as energy costs and cardiovascular demands are significantly greater in comparison with those of healthy individuals of similar age and body dimensions (Potempa et al., 1995).

Reduced fitness may be a secondary factor that limits the transfer of walking skills obtained during rehabilitation back into the community environment. At discharge, 60-70% of patients with stroke regain their ability to walk independently, but only 7% have sufficient capacity to ambulate outside their homes.
Similar findings are suggested by Mayo & Colleagues in a 1999 study of community dwelling individuals at one year post-stroke. In the study, poor walking endurance was the most striking functional limitation observed in the sample and was the only measure significantly associated with community reintegration (Mayo et al., 1999).

Despite the importance of exercise for reducing risk of stroke and improving rehabilitation outcomes, emphasis in stroke rehabilitation has traditionally been placed on the assessment and treatment of primary neurological impairments, including muscle weakness and loss of coordination (Duncan et al., 1987; Kelly et al., 2003). Many older adults with stroke have never been advised by a health care professional to engage in regular exercise or walking program, yet generalized recommendations have been formalized to promote physical activity after stroke (Gordon et al., 2004; Shaughnessy et al., 2006b). Such a discrepancy suggests that exercise tends to be an under-emphasized area of stroke rehabilitation.

Assessment of physiological factors is critical for effective self-management of stroke risk factors. Blood pressure should be evaluated by clinicians on a routine basis to determine clients’ cardiovascular status and candidacy for physical exertion. Regarding visceral adiposity, the Body Mass Index (BMI) is a simple calculation for evaluating a person’s level of body fat (Division of Nutrition and Physical Activity, National Center for Chronic Disease Prevention and Health Promotion, 2006). Finally, clients’ cardiorespiratory fitness can be regularly evaluated using heart rate assessments during rest and physical activity (Guyatt et al., 1985; Kelly et al., 2003).

Older adults should be educated and actively engaged in self-management of individual risk factors for stroke. Such measures are especially important in the stroke rehabilitation process to prevent the occurrence of future strokes in this vulnerable population. Although the chance of having a stroke increases with age, directed actions to manage risk and facilitate age-appropriate treatment can reduce its occurrence and impact.

**VI. Motor Factors**

Recovery of motor function is an important component of the rehabilitation process for survivors of stroke. Patients with stroke experience several primary neurological impairments that affect their movement. These primary impairments include hemiparesis/hemiplegia, tonal abnormalities, and deficits in coordination of movement (Ada et al., 2006; Lang, 2005a; Murawski, 2005). Hemiparesis/hemiplegia is considered the most typical neurological expression of stroke (Woodson, 2002). According to Lang (2005a), hemiparesis is defined as the partial loss of ability to activate motoneurons on one side of the
corticospinal system. In contrast, hemiplegia refers to a total loss of ability to activate such motoneurons (Lang, 2005a). These deficits in motoneuron activation manifest in mild weakness to complete paralysis on the side of the body opposite the site of the lesion (Woodson, 2002). Studies suggest that the initial grade of paresis appears the most important clinical predictor for motor recovery (Bonita & Beaglehole, 1988; Dominkus et al., 1990; Hendricks et al., 2002; Jorgensen et al., 1995). For example, Jorgensen & Colleagues (1995) found that a patient with mild leg paresis on admission was 4 times as likely to show motor recovery as a patient with initial leg paralysis. Similarly, Dominkus & Colleagues (1990) found that patients with initial upper extremity paresis were 4.58 times as likely to show motor recovery as patients with initial paralysis.

In addition to hemiparesis, persons with stroke often experience tonal abnormalities following their injury. Hypotonicity, defined as a reduction in passive muscle resistance, occurs early on in stroke and is how the body reacts immediately after loss of corticospinal input (Lang, 2005a). Hypertonicity, or increased muscle tone, often develops after the initial hypotonicity resolves and is frequently in the form of spasticity (Watkins et al., 2002). Spasticity is defined as a velocity-dependent resistance to muscle stretch experienced by a clinician attempting to flex or extend a patient's limb (Welmer et al., 2006). This resistance is believed to be caused by hyperexcitability of the stretch reflex (Welmer et al., 2006). In a 2002 study by Watkins & Colleagues, 39% of patients with first-ever stroke were found to have spasticity at 12 months post-injury. Interestingly, another study found a low correlation between muscle tone and disability scores at 3 months post-stroke, with severe disabilities seen in almost the same number of spastic and nonspastic patients (Sommerfeld et al., 2004).

Patients with stroke also have frequent difficulty with coordination and/or organization of movement (Ma & Trombly, 2002; Trombly & Wu, 1998). Such deficits can take the form of ataxia, which is a disorder of coordination that is often used in reference to gait or movements of a specific limb (Ienega et al., 2006). Studies report that ataxic patients walk with a widened stance, prolonged double support period, augmented activities of the proximal muscles, and slower speed (Mitoma et al., 2000; Palliyath et al., 1998). Lang (2005a) reports that ataxic difficulties are worse when persons move fast and that severity of ataxia is reduced when proximal body segments are stabilized due to lessened interaction torques. In addition to ataxia, coordination deficits are also present in the form of dysarthria-clumsy hand syndrome, a condition characterized by the combination of facial weakness, dysarthria, and mild hand weakness and clumsiness (Arboix et al., 2006; Papamitsakis, 2005). Dysarthria-clumsy hand syndrome is reported to occur in 2-16% of all lacunar stroke syndromes (Papamitsakis, 2005).
Stroke survivors also experience many secondary problems as a consequence of the primary neurological impairments. Since primary impairments take time to resolve, secondary impairments arise as adaptations to the primary deficits (Ada et al., 2006). More specifically, it is believed that these secondary problems relate to the immobility that often follows patients’ primary impairments (Ada et al., 2006; Lang, 2005a). Secondary problems include disuse atrophy, decreased active range of motion, contracture, subluxation, and cardiac deconditioning (Ada et al., 2006).

Regarding assessment of motor factors, the Action Research Arm Test (ARA) is a common assessment of upper extremity motor function that examines clients’ grip, grasp, pinch, and gross motor movements of the elbow and shoulder (Carroll, 1965; Hsieh et al., 1998; Rabadi et al., 2006). Other common motor assessments include the Modified Ashworth Scale (MAS) for muscle tone, the 9-Hole Peg Test for fine motor coordination, and the Finger Nose-Finger test for gross motor coordination (Blumenfeld, 2001; Bohannon & Smith, 1987; Croarkin et al., 2004).

Given the impact of stroke on motor abilities, it is important for therapists to promote motor learning to improve patients’ function. Motor learning is defined by Lang (2005b) as the process of acquiring a motor skill so that it can be performed consistently and efficiently over time. Literature also sometimes uses terms such as “skill acquisition” and “motor adaptation” when describing motor learning (Krakauer, 2006; Shedmehr et al., 2005). According to Fitts & Posner (1967), there are three stages of motor learning: Cognitive, associative, and autonomous. As a person progresses through the three stages, motor performance becomes more skilled and attentional demands shift from explicit to implicit (Polatajko & Mandich, 2004). Evidence suggests that motor learning does not occur in the absence of feedback, and also does not occur in the absence of practice (Krakauer, 2006; Schmidt & Lee, 1999).

Regarding treatment, motor learning interventions can follow a traditional format or a more contemporary model. Traditional motor learning models (Rood, PNF, NDT, Brunnstrom) propose that movement is hierarchical and reflex-driven and argue that increasing motor components will increase functional use of the body (Horak, 1991; Langhammer et al., 2000). In contrast, contemporary motor learning theories (CIMT, Task Oriented Approach, Motor Relearning Programme) propose that movement emerges from the interaction of systems and that meaningful activity organizes the central nervous system (Bass Haugen & Mathiowetz, 1995; Horak, 1991; Langhammer et al., 2000). It is also proposed in contemporary theory that motor learning occurs in the context of practicing whole tasks rather than components (Langhammer et al.).
Recent literature seems to support a contemporary motor learning model as opposed to a hierarchical model in stroke rehabilitation (Bonifer et al., 2005; Dettmers et al., 2005; Dromerick et al., 2000; Hafsteinsdottir et al., 2005; Langhammer et al., 2000). Several studies have demonstrated significant improvements in patients’ upper extremity function and related outcomes following Constraint Induced Movement Therapy (CIMT), a contemporary treatment emphasizing functional use of the involved upper extremity (Bonifer et al., 2005; Dettmers et al., 2005; Dromerick et al., 2000). Another study found that rehabilitation with task-oriented strategies, represented by the Motor Relearning Programme, was more effective in improving motor function and reducing hospital length of stay than treatment with facilitation/inhibition strategies via the Bobath program (Langhammer et al., 2000). Finally, Hafsteinsdottir & Colleagues (2005) found no effect of Neurodevelopmental Treatment (NDT) during hospital care with respect to functional outcome assessed at 6 and 12 months post-stroke. The study was also unable to demonstrate beneficial effects of NDT on quality of life measures at any time post-stroke.

The impact of stroke on motor recovery is complex and multidimensional. Many factors must be considered when determining how to best approach patient care. Recent literature is suggesting a shift in theory from hierarchical approaches to more contemporary, task-oriented models. Future treatments in the field of stroke rehabilitation should reflect this shift in theoretical framework to best reflect evidence-based practice.

VII. Sensory Factors

Sensory deficits in older adults with stroke are common and encompass a variety of sensory domains. Homonymous visual field deficits (HVFDs) are among the most frequent consequences of brain injury. 30% of all patients with stroke and 70% of those with stroke involving the posterior cerebral artery have hemianopsias (Brandt et al., 1995; Pambakian & Kennard, 1997). Patients with HVFDs have particular difficulties with reading and visual exploration that have far-reaching repercussions on their domestic and vocational lives (Kerkhoff, 2000; Zihl, 2000). Yet, a large number of these patients are not aware of their visual field deficits and many are still driving (Gilhotra et al., 2002). HVFDs caused by ischemia show recovery of the full visual field in fewer than 10% of cases (Pambakian et al., 2005). Interestingly, functional brain reorganization may allow recovery of function after the resolution of peri-infarct edema and reperfusion of the ischemic penumbra (Nelles et al., 2002). However, the strict unilateral retinotopic representation of the primary visual cortex likely limits the degree of reorganization that has been observed in other neural networks that are organized in a more extended and overlapping fashion.
HVFDs are associated with a reduced prognosis for successful rehabilitation from stroke, particularly when combined with visual neglect (Han et al., 2002; Jehkonen et al., 2000; Patel et al., 2000). A variety of different approaches, including optical aids and visual training techniques, have been examined for the rehabilitation of persons with HVFDs (Kerkhoff et al., 1994; Lee & Perez, 1999; Peli, 2002; Zihl, 1995). Despite the anecdotal evidence that has accumulated, rigorously controlled trials that clearly establish the efficacy of any one method are lacking (Pambakian et al., 2005).

Somatosensory deficits are another frequent outcome of stroke. According to an epidemiologic survey by Sterzi (1993), somatic sensation is impaired in 37% of patients with a lesion to the right hemisphere and in 25% of patients with a lesion to the left hemisphere. In addition, a 1996 study by Kim & Choi-Kwon found that 22 of 25 patients initially diagnosed as having pure motor stroke actually had dysfunctional discriminative sensation when evaluated on a comprehensive sensory battery. The authors argue that accurate testing is important since decreased sensation may explain the subtle clumsiness and disability of patients with apparently normal sensory functions (Kim & Choi-Kwon, 1996). Literature suggests that the most evident consequences of somatosensory impairment are deficits in tactile recognition and manipulation of objects, danger of burns or other injuries to the insensate limb, impairment of motor control of the affected limb, deficits in controlling the level of force of the hand during grasping, and poor balance in an upright position and during ambulation (Aglioti et al., 1996; Smania et al., 2003). Despite the clinical relevance of somatosensory deficits, little attention has been given to the rehabilitation of somatosensory function (Smania et al., 2003). Nonetheless, both animal and human studies have shown that somatosensory structures in the brain possess a high degree of plasticity (Aglioti et al., 1999; Xerri, et al., 1998) and that rehabilitative training specifically aimed at restoring somatosensory deficit and related disabilities can lead to significant functional improvements (Carey et al., 1993; Xerri et al., 1998).

Pain is another frequent sensory complication of stroke with three varieties reported in the literature: central post-stroke pain (CPSP), nociceptive pain mainly in the shoulder/arm, and tension-type headache (Anderson et al., 1995; Jespersen et al., 1995; Vestergaard et al., 1993). These three pain conditions have been found to occur in stroke survivors up to 2 years post-stroke, suggesting that pain is often experienced on a long-term basis (Widar et al., 2002). Studies report that chronic pain interferes with many aspects of living, with pain-related problems including disturbed sleep, fatigue, mood changes, stress in relationships, and preoccupation with the meaning of pain (Widar et al., 2002; Widar et al., 2004). Regarding coping strategies for chronic pain in survivors of stroke, a 2004 study revealed that the most common strategies were making the pain comprehensible, planning of activities, taking medications,
communicating, and distractions (Widar et al., 2004). Other studies have focused more exclusively on shoulder pain in stroke recovery (Snels et al., 2000). According to Price & Pandyan (2001), development of a painful hemiplegic shoulder complicates and prolongs rehabilitation, increases the length of hospitalization, and can result in poor arm function 12 weeks after stroke. In addition, the presence of shoulder pain related to weakness of the upper limb and restriction in active range of motion may ultimately contribute to poor functional recovery of the upper limb during rehabilitation (Price & Pandyan, 2001).

Deficits in the sensory control of balance are also seen following stroke. According to Bonan & Colleagues (2004), balance control requires the integration of many types of sensory information. Yet, literature suggests there is an overemphasis on motor control theories in rehabilitating balance at the expense of properly acknowledging sensory contributions (Bonan et al., 2004a). Recent literature suggests that patients with stroke find it very difficult to maintain balance when visually deprived, and often compensate for this limitation by visual overuse (Bonan et al., 2004a; Bonan et al., 2004b). This excessive reliance on visual input has been shown to interfere with patients’ ability to correctly respond to somatosensory and vestibular input (Bonan et al., 2004a; Bonan et al., 2004b). Attention to sensory factors involved in balance is important as decreased balance can present a safety hazard during occupational performance as well as contribute to falls and immobility (Marsden et al., 2005).

Given the significance of sensory disturbance in older adults with stroke, a thorough assessment of sensory factors is critical in this population. Key visual assessments include near and distance visual acuities, visual fields, and color/contrast discrimination (Watson, 2001; Zoltan, 1996). Regarding pain, the Faces Pain Scale (FPS) has been successfully used with adults with cognitive loss and has demonstrated reliability and validity when used with patients with left hemisphere stroke (Benaim et al., 2006; Bieri et al., 1990). Finally, balance can be easily measured via the Berg Balance Scale (Berg et al., 1992), and examples of somatosensory tests include tactile detection thresholds with Semmes-Weinstein monofilaments, touch localization, warm and cold detection thresholds, and stereognosis (Julkunen et al., 2005).

VIII. Spiritual Factors

A stroke is a stressful life event that can challenge survivors’ confidence and quality of life (Robinson-Smith, 2002). While stroke impairments vary across individuals, the subjective experience of a stroke can be difficult for all survivors to manage. Literature suggests that spiritual practices can assist with coping during stroke recovery by altering the appraisals made about meaning and control (Arnaert et al.,
Understanding the role of spirituality in stroke recovery is important for promoting well-being and optimizing patient care (Arnaert et al., 2006; Robinson-Smith, 2002).

One component of spirituality evident in survivors of stroke is hope. While hope is defined in a variety of ways in the literature, most definitions reveal that hope is futuristic, action-oriented, motivating, and related to expectancy (Arnaert et al., 2006; Forbes, 1994; McGee, 1984). For many persons, hope is an energy source that results from a sense of interconnectedness with the self, others, and powers beyond the self (Arnaert et al., 2006). Hope and belief in self-defined goals motivate and empower survivors to actively engage in rehabilitation (Popovitch et al., 2003). Studies suggest that patients with hope are less demanding and clinically more compliant than those without hope (Elliott & Olver, 2002), which in turn facilitates clinical treatment and progression to recovery (Arnaert et al.). A recent qualitative study by Arnaert & Colleagues examined perceptions of hope in stroke survivors during the acute care phase. Interview data revealed five general themes impacting the healing process. These themes included 1) Storytelling, 2) Vision of hope, 3) Worries and concern for the future, 4) Type of hope, and 5) Self-healing (Arnaert et al.). Of these themes, storytelling and type of hope were identified as particularly important findings. Participants in the study felt an intense need to “tell their story,” describing both the physical symptoms of their stroke as well as the emotional and social impact of the experience (Arnaert et al., 2006). Storytelling provided participants with a means for articulating their fears, anxieties, uncertainties, and visions of hope (Arnaert et al.). Other literature acknowledges this healing power of storytelling, stating that it nurtures the self-spirit by helping a person to answer existential questions about the meaning of life (Baker & Greene, 1987; Banks-Wallace, 2002; Goss & Goss, 1995). Regarding participants’ type of hope, two varieties were found in the study: passive and active (Arnaert et al.). Persons with passive hope were unable to own and use their hope as a tangible force to move forward (Arnaert et al.). Such persons frequently identified the medical healthcare system as their source of hope, which is primarily located external to the individual. As a result, these individuals appeared preoccupied with their present reality and its associated stresses, and unable to foresee the future (Arnaert et al.). In contrast, persons with active hope found strength and motivation from within themselves (Arnaert et al.). Such persons were able to actively engage in their current life situation and establish plans of action for achieving goals (Arnaert et al.). Other literature supports this distinction, stating that active hope mediates the progression from suffering to self-healing in persons with chronic disease (Brauer et al., 2001; Lohne & Severingsson, 2004; Morse, 1997).
Another component of spirituality in persons with stroke is prayer. In a 2000 study by Robinson-Smith & Colleagues, 36% of stroke survivors identified prayer as a strategy for increasing confidence after stroke. This finding suggests that prayer may be an important self-efficacy approach in persons with stroke (Robinson-Smith et al., 2000). In addition, patients expressing high personal faith in God had higher quality of life than those who reported little personal faith in God (Robinson-Smith et al). In a related study, Robinson-Smith (2002) examined patterns of prayer and coping at 1 year post-stroke. Four major themes were identified in the study: 1) Connecting to God, 2) Ways of praying now, 3) Reaching back to early family life, and 4) Finding strength through prayer (Robinson-Smith, 2002). Regarding the first theme, stroke survivors described reaching toward God as a way to improve their confidence after stroke. They also expressed belief in a guiding spirit or higher power with statements such as, “God has always been with us,” and “God will help us get better” (Robinson-Smith). Higher perceived control, even when attributed to God, may result in fewer depressive symptoms and a lower stress response due to the mind-body connection (Ferington, 1986; Schrader, 1996). In regard to the second theme, some patients used specific prayers each day of the week to pray for themselves and others. Other participants engaged in patterns of praying during weekly church services or by praying to special people such as the “Blessed Mother” (Robinson-Smith). Idler (1995) suggests that one way prayer may improve adjustment to stroke disability is by promoting a nonphysical sense of self. Thus, prayer may assist patients in transcending physical limitations (Idler, 1995). The third theme reflects the participants’ tendency to reminisce on previous life experiences related to prayer. In particular, many participants mentioned first learning to pray in childhood as well as spending much time in church throughout their lives (Robinson-Smith). According to Butler (1980), life review theory provides a framework for understanding past experiences in the context of present life. For older adults, such as the post-stroke survivors in the study, examining past memories about family religious beliefs is a normal process that provides meaning to life (Robinson-Smith). In addition, literature suggests that spiritual support established and maintained throughout family life may contribute to coping and the ability to tolerate long-term disability (Friedman, 1998). Finally, prayer provided participants with a source of strength from God. In many cases, God was asked to supply a reason for the stroke as participants sought an explanation for why they suffered. The strength obtained from these dialogues assisted participants in managing the crisis of their injury (Robinson-Smith).

Given that older adults are particularly susceptible to stroke (Michael & Shaughnessy, 2006), it is important to consider spirituality practices in the aging population. There is substantial evidence indicating the importance of religion to older adults. For example, Koenig (1998) found that over 85% of medically ill
older adults held intrinsic religious attitudes. In addition, studies indicate that one quarter to one third of older adults use religious beliefs and behaviors to cope with health problems and age-related stressors (Koenig et al., 1988; 1992; Koenig, 1994; 1998; Taylor & Chatters, 1986). A 2003 study by Benjamins & Colleagues found that older adults withdraw from social activities such as religious service attendance when faced with declining health. Given the significance of religion in this population, such a change might compound the effects of the illness itself (Benjamins et al., 2003). The relationship between chronic conditions and religious attendance may indicate that more extensive outreach programs for the sick are needed from religious groups (Benjamins et al.). In addition, this trend of reduced activity could potentially be counteracted by hospital- or community-based programs that offer transportation to religious services, information about television or radio programs, or invitations to Bible study or prayer groups (Benjamins et al.).

Assessment of spirituality is important in older adults with stroke. Often, spiritual factors are measured via semi-structured private interviews, as was done by Arnaert et al. (2006) and Robinson-Smith (2002). This qualitative approach enables in-depth exploration of religious issues as well as collection of rich, meaningful data (Robinson-Smith, 2002). As a more objective approach, the Activity Card Sort can reveal whether spiritual activities are something the client presently participates in or has given up since the stroke.

Spiritual practices are prevalent among both older adults and patients with stroke and are frequently used as coping mechanisms when these groups are faced with stress (Arnaert et al., 2006; Koenig, 1998; Robinson-Smith, 2002). Given these important relationships, clinicians should regularly assess spirituality in older adults with stroke to promote evidence-based practice and client-centered care.

**IX. Introduction to the Environment**

The intrinsic factors of stroke can have a pronounced effect on older adults’ occupational performance and participation levels. Although such component skills contribute to functional outcomes and stroke recovery, it is important that we not overemphasize these factors and overlook ways in which environmental contexts mediate performance. The environment is a multifaceted concept and can consist of physical, social and cultural settings in which people live and conduct their lives (World Health Organization [WHO], 2001). Environmental factors exist outside of the individual and interact with aspects of the person to influence everyday functioning (WHO, 2001).
Given the complexity of the environment and its relation to impairment, it is helpful to use a theoretical framework to consider these relationships. The Person-Environment-Occupation-Performance (PEOP) model describes occupational performance as the successful interaction between the person, the environment, and the occupation being performed (Baum & Christiansen, 2005). As such, all three of these factors must be considered in order to enable clients to perform the occupations they need to, want to, or are expected to perform (Baum & Christiansen, 2005). Additionally, The World Health Organization’s International Classification of Functioning, Disability, and Health (ICF) provides a unique model for understanding the relationship between impairment and everyday life consequences (WHO, 2001). The ICF suggests there are life consequences to impairments and that the environmental context plays a role in mediating and compounding these consequences. Moreover, the ICF indicates that it is the interaction between person and environment, not the impairment alone, which produces health or disability (WHO, 2001). The ICF therefore acknowledges the role of intrinsic factors in mediating performance and participation levels, but emphasizes that such factors are not the only components influencing these outcomes.

Occupational therapy literature acknowledges the importance of the environment for occupational performance and for therapy (Baum & Christiansen, 2005; Dunn, Brown, & McGuigan, 1994; Law, 1991; Law et al., 1996; Nelson, 1988). Occupational therapists understand that environments supporting clients' ability to use their skills can optimize their capabilities. There are times when it is easier to modify an environment than the person, depending on the condition and the context (Letts, Baum, & Perlmutter, 2003). Kielhofner & Forsyth (2002) also recognize the significance of the environment, arguing that occupational therapy consists primarily of using and creating conditions in the environment to support the client’s occupational engagement.

Environmental influences on performance and participation are not only acknowledged in occupational therapy literature, but also in research focused on older adults with stroke (Amarshi, Artero, & Reid, 2006; Hammel, Jones, Gossett, & Morgan, 2006; Reid, 2004a). In a 2006 study of persons with stroke living in the community, Hammel & Colleagues document environmental and systems level barriers to community participation. In the study, barriers were extensive and ranged from physical access issues to societal attitudes and beliefs about disability (Hammel et al). Similar findings are evident in studies examining persons with stroke as they transition and age in their homes (Amarshi et al., 2006; Reid, 2004a). These studies portray participation as a dynamic process rather than a static event, and point to the impact of environmental and societal barriers on participation choice and control (Amarshi et al., Reid).
Clearly, occupational performance and participation levels involve a complex mix of factors involving the person, environment, and activity being performed. Rehabilitation strategies for older adults with stroke must reflect this interaction of factors with attention given to all influencing issues. Using this perspective, practitioners must acknowledge the enabling and disabling aspects of the environment, as well as use the environment to structure success in treatment.

X. Social Support

Stroke is a significant chronic and disabling condition of the older adult population with long-term physical, emotional, and relational consequences (Egbert et al., 2006). According to Sit & Colleagues (2004), living with a stroke can be immensely complex and demanding for patients and their families. Given this impact, it is important that practitioners identify factors that can mediate patients' adjustment and recovery. One such factor may be social support, as this has been shown to have a positive impact on people's health and well-being, as well as their ability to adjust to trauma or injury (Bisconti & Bergeman, 1999; Hegelson, 2003; Lau & McKenna, 2001; Newsham, 1998; Tsouna-Hadjis et al., 2000). According to Friedland & McColl (1992), social support is “the experience or information that one is loved and cared for, valued and esteemed, and able to count on others should the need arise” (p. 574). In their definition, Friedland & McColl delineate three separate dimensions of social support: A functional dimension outlining different types of support, a structural dimension including all social network characteristics such as size and sources of support, and an appraisal dimension including the individual's satisfaction and subjective appraisal of received support (1992).

As social support is a multifaceted concept, social support studies in stroke recovery have investigated different aspects of this concept, including the types of support, the timing and structure of support, issues of caregiving, and use of resources (Colantonio et al., 1993; Egbert et al., 2006; Friedland & McColl, 1992; Glass & Maddox, 1992; Grant et al., 2001). Although stroke research studies have only recently begun to include social support as a predictor variable, it has already been shown to enhance stroke recovery (Colantonio et al., 1993; Glass & Maddox, 1992; Lau & McKenna, 2001; Mackenzie & Chang, 2002; Tsouna-Hadjis et al., 2000; Wilcox, Kasl, & Berkman, 1994).

Several studies examine the types of social support received by persons with stroke during their recovery. Friedland & McColl (1989) assessed the nature of social support in stroke rehabilitation, and demonstrated that social support from personal sources accounted for 79% of the total variance explained by the model. In this study, the chosen assessments considered satisfaction and quality of social support
along with practical and descriptive aspects of support (Friedland & McColl, 1989). In another study, Glass & Maddox (1992) found that different types of support influence rehabilitation outcomes in different ways. For example, patients with a high level of emotional support showed a dramatic improvement in functional outcome, though they were often the patients with the greatest impairment at the start of rehabilitation. In addition, instrumental support provided in moderate amounts was most closely related to positive outcomes, and was shown to be mediated by the severity of the stroke (Glass & Maddox, 1992).

The timing of the provision of social support is also argued to have an impact on stroke outcome (Hegelson, 2003). Social support provided at an inappropriate time during the stroke recovery process may not have an effect on functional status (Glass & Maddox, 1992; Friedland & McColl, 1992). In a randomized trial with 48 participants and 40 control participants, Friedland & McColl (1992) hypothesized that social support should be provided as soon as a person is medically stable in order to be most effective. In the study, measures were taken at three different points: Entry into the study, immediately after intervention, and 3 months after intervention. Despite the researchers’ expectations, no significant treatment effect was found and no significant difference between the groups was reported regarding social support and outcome. The investigators discuss this outcome and conclude that the non-significant findings may be due to the timing of the intervention, the high incidence of psychiatric symptoms found in the sample, or the nature of the support given during the crisis period (Friedland & McColl).

Another area of research has looked at the structure of social support networks in persons recovering from stroke (Colantonio et al., 1993; Mendes de Leon et al., 2006). In one longitudinal study, Colantonio & Colleagues (1993) found that the strength of a person’s social network was related to his/her need for post-stroke institutionalization. In particular, the more securely the patient was embedded in a social network before the stroke, the less need he or she had to live in an institution (Colantonio et al., 1993). Such results suggest that social support networks may have a buffering effect on a person’s health and need for outside support, and point to the importance of issues such as social capital (Mendes de Leon et al., 2006).

Other bodies of social support literature consider the impact of caregiving on the caregiver, the patient, and the relationship between them (Grant et al., 2001; Kinney et al., 1995). Some programs of research targeting stroke survivors and their families aim to identify those family caregivers at risk for burnout and depression. In these studies, predictors of potential problems included the cognitive ability of the patient as well as socioeconomic variables of the providers such as income and age (Schwarz & Blixen, 1997; Tompkins, Schulz, & Rau, 1988). Other studies report that interventions utilizing techniques such as
problem-solving and stroke education are effective in improving a caregiver’s ability to facilitate the stroke survivor’s recovery (Glass et al., 2000; Grant et al., 2001). While all of these studies look at issues of caregiving in different ways, they all point to the importance of social support for promoting health and well-being of the patient and the family.

Newer research has examined the kinds of resources named by persons with stroke when dealing with recovery challenges (Egbert et al., 2006). Egbert & Colleagues (2006) found that community integration is less dependent on the patient’s level of disability and is more a function of the ability of the person to utilize internal resources (e.g., motivation, a positive attitude) in the mobilization of external resources (e.g., social support from friends and family, formal resources such as support groups and assistive devices). In this study, many survivors with high levels of impairment were able to better resume their employment, leisure, and relational roles than persons with less physical impairment. Such findings seem to reflect a shift from a traditional disability-focused model to a more contemporary, problem-solving perspective.

Collectively, the findings presented in this paper suggest the need for occupational therapy professionals to expand their practices to include the promotion of social support. An important first step in achieving this goal is for practitioners to include measures of social support in their clinical assessment battery. A simple and valid tool for assessing social support in persons with stroke is the Duke Social Support Index (Landerman et al., 1989), which uses a questionnaire format to measure the patient’s perceived level of support received from family and friends. Moving beyond assessment, intervention strategies in rehabilitation programs should go beyond traditional clinical training to include practices that foster social support and community participation. Such a shift in practice will better emphasize the social and relational needs of older adults with stroke.

XI. Social Capital

As the baby boom generation moves into retirement, the number of older adults is expected to rise considerably (Pollack & von dem Knesebeck, 2004). It is estimated that by the year 2050, the number of Americans age 90 and above will grow to 10 million (Glass et al., 1999). In addition, life expectancy of this age group has changed dramatically over the past few decades. It is now expected that over a quarter of individuals 65 years and older will live until they are 90 (Glass et al.). To support these demographic transitions, it is important to determine social and community factors that promote successful aging (Rowe & Kahn, 1998). Social capital is one such factor that has been linked to health and may be of particular
significance for older adults (Cannuscio, Block, & Kawachi, 2003; Glass & Balfour, 2003). According to Putnam (1995), social capital refers to the “features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit” (p. 67). Macinko & Starfield (2001) add to this definition, arguing that social capital may function on at least four levels: Through individual behaviors such as community participation, through individual norms such as trust in the community and perceptions of community reciprocity, through neighborhood environments, and through issues at the macro-systems level including historical, social, political, and economic features.

There are a range of explanations for the positive influence that social capital can have on health. For example, recent studies of the general population have shown that social capital can boost self-esteem, provide social support, help people to access better resources, and buffer against stressful life events and chronic illness (Ahern & Hendryx, 2005; Campbell & Wood, 1999; Woolcock & Narayan, 2000). Additionally, recent studies have shown that high social capital is associated with lower mortality and fewer accidents and suicides (Kaplan et al., 1996; Kawachi et al., 1996; Kawachi et al., 1997; Wilkinson, 1996). Clearly, such literature depicts the importance of social capital and its widespread effects on the overall health of the population.

In addition to improving the health of the general population, social capital is also argued to impact the health and well-being of older adults. According to Cannuscio & Colleagues (2003), changes in physical and cognitive ability may mean that older individuals come to depend heavily on social capital at all levels. Having higher levels of trust and more perceived reciprocity may afford older individuals greater emotional, monetary, and logistical resources (Cannuscio et al., 2003). Neighborhoods high in social capital may also increase assistance to the older adult and promote feelings of security and active engagement (Cannuscio et al., Glass & Balfour, 2003). Other literature has shown that older adults embedded in active social networks have better physical health and lower disability than those less involved with other people (Mendes de Leon et al., 2003; Thompson & Krause, 1998). Such findings point to the significance of community membership to older adults’ well-being, as well as to the impact of trust and reciprocity in the mobilization of resources.

Despite the importance of social capital to older adult populations, there is a paucity of studies in the stroke rehabilitation literature that examine social capital. This is an interesting finding considering nearly ¾ of all strokes occur in individuals 65 years of age and older (Michael & Shaughnessy, 2006). The majority of studies examining social topics in this population emphasis social support and issues of caregiving, with little mention of issues acting at a broader, community level. Some studies do mention
concepts reminiscent of social capital, however, these studies do not label this as such and are operating from different perspectives. For example, Colantonio & Colleagues (1993) found that the more securely a person was embedded in a social network prior to a stroke, the less need he or she had to live in an institution during recovery. While this finding implies the buffering effects of social capital, the authors discuss this finding in the context of social support and do not provide commentary on its relevance to the community as a whole.

Occupational therapists are in a prime position to bridge this gap in stroke rehabilitation. As occupational therapists, it is our goal to foster and enable participation and community integration in the clients that we treat. It is also our duty to advocate when barriers are present that limit success in everyday life. Social capital can have a large impact on our clients’ participation and community involvement. Social capital can also affect the community as a whole, a community in which our clients are expected to function within. As mounting evidence is suggesting that social capital can improve health, we need to think about how this can enhance the quality of life of our clients. By addressing issues of social capital in our practice, we can treat our clients in a more comprehensive and holistic manner, which is important given that client-centered therapy is an ideal of our profession.

To consider issues of social capital, occupational therapists can begin by evaluating social capital in the clients they treat. According to Lochner & Colleagues (1999), there is no definitive guide to the measurement of social capital due to insufficient theoretical and empirical work. However, recent studies describe social capital measures that may be of use to occupational therapists. Pollack & von dem Knesebeck (2004) present measures of reciprocity and civic trust in their study of social capital in the elderly. According to these authors, perceptions of reciprocity can be assessed by asking people whether they agree with the statement: “In my neighborhood, most people are willing to help others.” Similarly, civic trust can be evaluated by the statement: “I can trust most people in my neighborhood.” Both statements are then scored on a 5-point Likert Scale ranging from strongly agree to strongly disagree (Pollack & von dem Knesebeck, 2004). Other studies use a 13-item measure of neighborhood connectedness to assess the impact of social capital on health and well-being (Department of Health and Human Services, 1999; Young, Russell, & Powers, 2004). In this measure, item responses are scored on a Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree), with the mean item score providing an aggregate measure of neighborhood satisfaction (Young, Russell, & Powers, 2004). By assessing social capital, occupational therapists will clearly be in a position to identify broader issues impacting the quality of life of their clients. Such information can and should be used to design interventions to maximize participation in everyday life.
XII. Culture

Culture is an important issue in contemporary health care. Culture is broadly defined as a shared system of values, beliefs, and learned patterns of behaviors (Low, 1984), and is not simply defined as ethnicity (Carrillo et al., 1999). Health care providers today face the challenge of caring for patients from many cultures who have different languages, levels of acculturation, socioeconomic status, and unique ways of understanding illness and health care (Carrillo et al., 1999). Patient satisfaction and compliance with medical recommendations are closely related to the effectiveness of communication and the patient-provider relationship (Novack, 1995). Because sociocultural differences between provider and patient can lead to communication and relationship barriers (Takeuchi et al., 1995), understanding the concepts inherent to overcoming these challenges is extremely important.

Like many health conditions, stroke is clearly influenced by cultural factors. Much literature documents the ethnic disparities in the epidemiology of stroke in the United States (Centers for Disease Control and Prevention [CDC], 2005a, 2005b; Gorelick, 1998; Stansbury et al., 2005; Thom et al., 2006). It is argued that African Americans are disproportionately impacted by stroke, with literature demonstrating these patients have worse residual impairment and greater mortality compared with Caucasians (CDC, 2005a, 2005b; Stansbury et al., 2005). It is reported that among the leading causes of adult death in the United States, the disparity in the ratio of black to white mortality is greatest for stroke (Gorelick, 1998). It is also clear that African Americans tend to have strokes at an earlier age than Caucasians (Stansbury et al., 2005). Perhaps most concerning, however, is that blacks have almost twice the risk of first-ever stroke compared with whites (Thom et al., 2006). Interestingly, literature also suggests possible stroke disparities in the Hispanic American population (Pandey & Gorelick, 2005). For example, existing evidence suggests a less favorable cardiovascular and cerebrovascular profile for Hispanic Americans compared with Non-Hispanic whites (McGruder et al., 2004; Mitchell et al., 1990). However, these issues are much less clear as there is a lack of research examining the epidemiology of stroke in Hispanic Americans (Pandey & Gorelick, 2005).

In addition to disparities in stroke incidence, there are also disparities in post-acute stroke care. A 2005 study by Bhandari & Colleagues examined outcomes of inpatient stroke rehabilitation across different racial groups. The study found that blacks achieved less functional improvement at discharge compared with whites, and, despite worse FIM scores, were more likely to be discharged to the home environment (Bhandari et al., 2005). In contrast, Asian-American patients did not differ from whites in terms of functional
improvement at discharge, but were found to have less improvement at 3 month follow-up (Bhandari et al.). Additional disparities were documented in a 2003 study by Horner & Colleagues, who found that functional recovery at 1 year post-stroke was impaired for low-income black veterans who experienced delays in beginning rehabilitation. Such findings point to the role of poverty and/or financial constraint as a mediator of functional improvement.

Much of the ethnic disparity in stroke may be due to higher rates of cardiovascular risk factors in minority populations (Gorelick, 1998; Sacco et al., 2001). In general, cardiovascular risk factors, such as hypertension, diabetes mellitus, smoking, and obesity, have been more prevalent in African American cultures (Ford et al., 2000; Gorelick, 1998; Hall et al., 1997; Lynch et al., 1999; Quershi et al., 1995). A study focusing on the black African diaspora and its relation to hypertension suggests that the prevalence of hypertension increases as blacks move from western Africa (16%) to the Caribbean (26%) to mainland United States (33%), (Cooper et al., 1997). These differences may be explained at least in part by socially linked factors, such as obesity and sodium/potassium consumption. This raises the question of the possible role of social influences, such as acculturation, urbanization, and affluence, as event determinants of stroke and other cardiovascular diseases in blacks (Gillum, 1996). It is also suggested that African Americans acquire stroke risk factors at an earlier age and have a greater severity of stroke risk factors than Caucasians (Gorelick). Such issues could also serve as an explanation for the higher stroke burden in African Americans.

Despite the high prevalence of major cardiovascular risk factors in African Americans, there may be other explanations for the disproportionate burden of stroke in minority populations. In particular, socioeconomic status, health illiteracy, and geographic location may be important issues to consider (Fang et al., 1996; Gorelick, 1993). Stroke death rates for both American blacks and whites are generally highest in an area dubbed the “stroke belt” located in the Southeastern United States. The absolute highest rates of mortality from stroke are in an area called the “stroke buckle” which includes the coastal plain of the Carolinas and Georgia (Gorelick, 2004). Regarding health illiteracy, 43% of ethnically diverse patients report difficulty understanding information presented in the clinical encounter (Eiser & Ellis, 2007). It is suggested that health illiteracy is a common hindrance to optimal health care for African American populations, and is often related to education level and socioeconomic disadvantage (Eiser & Ellis, 2007; Schillinger et al., 2002). Other socioeconomic studies suggest that insurance may represent a barrier to stroke care (Gregory et al., 2006; Kramer et al., 2000). A study of older stroke patients showed that in comparison with health maintenance organizations, patients with fee-for-service plans were more likely to
gain access to acute inpatient rehabilitation (Kramer et al., 2000). Another stroke study found black-white
differences in the type of insurance used by patients, with more white patients using Medicare than black
patients (Gregory et al., 2006). Currently, prior approval of Medicare is not a requirement for gaining
access to rehabilitation services, but it is a requirement for other types of insurance. If a certain population
has insurance that requires pre-certification to gain access, this could pose a barrier to patient care
(Gregory et al).

Some authors argue that the issue of health disparities in African American populations is more
complex than simply cardiovascular risk or socioeconomic burden. For example, some authors suggest
that mistrust of the medical community is an important aspect of the African American experience of health
care. African American history in the United States includes a protracted period of slavery, post-
Emancipation “Jim Crow” discrimination and persecution in the South, and an extended period of
socioeconomic disadvantage during ghettoization in northern cities (Eiser & Ellis, 2007). Health care during
these periods was often unavailable to African Americans, and/or the quality and quantity of care was
deficient. Specific medically-related discrimination included hospital ward segregation and the well-known
U.S. Public Health Service-sponsored Tuskegee syphilis study in which informed consent was not used
and indicated treatment was withheld without the patients’ knowledge (Gamble, 1997; Rosenberg, 1987).
The cumulative effect of these negative experiences continues to foster distrust of health care providers
and the health care system within the African American community (Gamble, 1997). This distrust may
manifest in low adherence to medical advice and decreased use of preventive health care services.

Additional complex issues that may influence stroke disparities for African Americans are religion
and spirituality. Many African Americans have either a religious orientation or a viewpoint grounded in
African American social and cultural history, which may emphasize a holistic approach to health and health
care (Eiser & Ellis, 2007). Such beliefs can have a strong role in establishing African Americans’ health
care attitudes and practices. With a holistic approach to health, individuals may expect broader issues of
faith and belief to be addressed in the clinical encounter in addition to biological needs (El-Kadi, 1994). If
such issues are not addressed or acknowledged by the health care provider, the result can be the patient’s
mistrust of the provider and noncompliance with the medical regimen (Eiser & Ellis, 2007). In addition,
some of the less mainstream churches in African American culture embrace a fundamentalist religious
belief that God will cure an illness without medical treatment (Kinney et al., 2004). Such beliefs can
potentially complicate medical care by delaying appropriate interventions. Moreover, many African
Americans have a deep sense of spirituality, with this spiritualism intertwined with other aspects of their
lives including health (Baer, 1981). Traditional African folk beliefs concerning health and illness focus on herbal remedies to cleanse the body of disease, as well as magical aspects of illnesses invoking spiritual components (Davis, 1998). According to Eiser & Ellis, it is not uncommon for an African American today to try a home remedy before seeking medical treatment. In particular, a 2001 study reveals that elderly African Americans are more likely than elderly Caucasian patients to view traditional home remedies as efficacious, and are less likely to seek medical intervention for their ailment (Ibrahim et al). Certainly, religion and spirituality are controversial topics. However, it is nonetheless clear that such beliefs are important considerations in modern day health care.

Cultural issues are undeniably present in stroke care and affect the patient’s approach to treatment. A patient enters a therapy setting with certain beliefs, concerns, and expectations about his/her illness and the medical encounter. This conceptualization of the illness experience can be described as the patient’s explanatory model (Eisenberg, 1977). The explanatory model refers to the patient’s understanding of the cause, severity, and prognosis of an illness, as well as his/her expectations for treatment (Eisenberg, 1977). In essence, the explanatory model represents the meaning of the illness to the patient, and it is to a large extent culturally-determined (Carrillo et al., 1999). When working in stroke rehabilitation, it is important to assess the client’s explanatory model. Kleinman et al (1978) developed a set of questions for exploring the client’s conceptualization of illness (Table 1). Although patients may initially be hesitant to reveal their beliefs and fears, such hesitation can often be overcome through further respectful questioning and reassurance (Kleinman et al., 1978).

Table 1. Exploring the Meaning of the Illness

<table>
<thead>
<tr>
<th>Explanatory model</th>
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</tr>
</thead>
<tbody>
<tr>
<td>What do you think has caused your problem? What do you call it?</td>
<td>Why do you think it started when it did?</td>
</tr>
<tr>
<td>How does it affect your life?</td>
<td>How severe is it? What worries you the most?</td>
</tr>
<tr>
<td>What kind of treatment do you think would work?</td>
<td></td>
</tr>
<tr>
<td>The patient’s agenda</td>
<td>How can I be most helpful to you?</td>
</tr>
<tr>
<td>What is most important for you?</td>
<td></td>
</tr>
<tr>
<td>Illness Behavior</td>
<td>Have you seen anyone else about this problem besides a physician?</td>
</tr>
<tr>
<td></td>
<td>Have you used non-medical remedies or treatments for your problem?</td>
</tr>
<tr>
<td></td>
<td>Who advises you about your health?</td>
</tr>
</tbody>
</table>

30
XIII. Physical Environment

The profession of occupational therapy has long acknowledged the role of environmental factors in promoting health and occupational engagement (Kiernat, 1972; Meyer, 1922; Reilly, 1962). According to Law & Colleagues (1996), occupational therapists use environmental modifications to create opportunities for participation in persons with disabilities (Law et al., 1996). Often, environmental modifications are directed at aspects of the physical environment in the home and community (Law et al., 1996). Stark & Sanford (2005) argue that the physical environment consists of both built and natural features, with common examples including doors, ramps, lighting, and pathways. Literature suggests that the physical environment can contribute to a person’s ability to function independently as it has the potential to either facilitate or hinder occupational performance (Hammel et al., 2006; Stark & Sanford, 2005).

Several studies have examined the physical environment and its impact on the everyday lives of persons with stroke (Hammel et al., 2006; Reid, 2004a; Reid, 2004b). A recent study by Hammel & Colleagues (2006) examined barriers to community participation in survivors of stroke. In the study, the most frequently identified barriers to community participation were in physical and/or cognitive access to community sites. Physical access issues included inaccessible entryways, bathrooms, and transportation systems, with key barriers including door thresholds and lack of handrails (Hammel et al). Regarding cognitive access, participants described a lack of environmental aids and supports for orientation, navigation, memory, and problem solving (Hammel et al). Many environments did not offer adequate signage to enable effective use of the setting, and many others failed to provide directions on how to seek assistance if needed. In environments that did provide signage, the signage and directions were often too complex to decipher cognitively and perceptually (Hammel et al).

Another study examined the person-environment fit of older adults with stroke and how it intersected with role performance in the home (Reid, 2004a). Analysis of in-depth interviews revealed that the physical environment had a large impact on the functioning of stroke survivors. Negotiating stairs and narrow doorways presented major barriers for participants. In addition, the inability to gain access to rooms and floors created a life for many stroke survivors where environmental centralization existed (Reid, 2004a). Environmental centralization refers to the way in which the home environment is manipulated over time to accommodate increasing limitations of the body through closing off peripheral areas and concentrating living space in central zones (Rubenstein, 1989). In this study, stroke survivors most frequently lived on one floor of the home, leading some individuals to relinquish certain roles and responsibilities (Reid).
A related study examined how older adults with stroke rate the accessibility of their housing environments (Reid, 2004b). Overall, participants reported that the design of their homes allowed them to manage self-care activities but not all household activities. For many individuals, the outside of the home posed barriers to occupational performance, with key issues including uneven ground, poor lighting, and stair access (Reid, 2004b). For others, physical space within the home was a problem with many persons unable to maneuver small areas with assistive devices (Reid).

Despite the literature on physical barriers to occupational performance and participation, there is also literature on environmental supports. Hammel & Colleagues (2006) report that some environments have built-in features that promote safety and access for persons with stroke. For example, some environments have grab bars on both sides, entryways with doors that accommodate walkers and canes as well as wheelchairs, built-in visual maps that are easy to use, picture signage, and information resources and instructions (Hammel et al., 2006). In addition to physical supports in the environment, Hammel & Colleagues also describe systems level supports for community participation. For example, transportation policies on national and local levels which provide accessible transport options can support participation of persons with stroke. However, Hammel & Colleagues argue that many individuals are not aware of these options or how to strategize their use depending on purpose. Another system support cited by Hammel & Colleagues is the openness and/or flexibility of community sites. For example, supportive community sites may provide help with preplanning access needs prior to the site visit and/or open the site ahead of time so that persons with disabilities can navigate and problem solve issues in advance. Flexible sites may also give guided tours of the site and respond proactively to recommendations to improve access (Hammel et al).

Given the well-documented barriers and supports to participation and performance in everyday life, it is important to assess the physical environment in rehabilitation of persons with stroke. One measure that may be of use to therapists is the Analysis of Cognitive Environmental Support (ACES), (Ryan & Polatajko, In development). The ACES is new measure based on the Home Occupational-Environmental Assessment (HOEA), (Baum & Edwards, 1998), and is designed to examine 1) how the home environment supports cognitive function and/or cues cognitive performance, 2) how the home arrangement may negatively impact cognitive performance, and 3) how cognitive loss may create hazardous situations in the environment. The ACES is administered in the client's home through observation and inquiry of the client and/or significant other. For therapists who are unable to travel to the home setting for assessment of the physical environment, a potential in-clinic assessment is the Usability in My Home Instrument, which is a
paper and pencil rating scale of the client’s perception of home accessibility (Fange, 2002; Reid, 2004b). The assessment uses a combination of open and closed-ended questions and recent studies have demonstrated its reliability and validity (Fange, 2002; Fange & Ivarsson, 1999; Iwarsson & Stahl, 2003). Finally, it is also important to consider environmental issues in the client’s community. For this evaluation, I propose the use of in-depth client interviews to provide qualitative information on barriers and supports to community participation. Such a qualitative approach has been used in the physical environment literature (Hammel et al., 2006; Reid, 2004a), and will enable therapists to collect rich and meaningful information to guide client intervention.

XIV. Technology

Occupational therapy and technology have had an important relationship throughout the years, with much literature demonstrating its contribution to optimizing occupation (Smith, 2000). Today, occupational therapists must be skilled in a variety of assistive technologies. Splints, wheelchairs, adapted kitchen utensils, and augmentative communication devices are all recognized as tools for therapists and clients (Smith, 2000). It is argued that the role of technology will only increase as the profession of occupational therapy moves into the future. According to Smith, contemporary occupational therapists will increasingly provide assistive technology interventions to their clients, assist persons with disabilities to adapt to technological environments, and design tools that appeal to a variety of patient capacities.

Older adults with stroke are particularly vulnerable to the impact of technology. There is an extensive body of literature describing the use of innovative technologies for rehabilitating survivors of stroke. One such technology is virtual reality, which has been used as an assessment and treatment tool in rehabilitation in recent years (Ring, 1998; Rose et al., 1999; Schultheis & Rizzo, 2001). Virtual reality (VR) is a new technology based on computerized simulation and real-time visual, auditory, and in some cases, haptic feedback (Weiss & Jessel, 1998). A proposed benefit of VR is that it has inherent ecological validity, enabling a therapist to present intervention within contexts that are both realistic and more meaningful to the client (Schultheis & Rizzo, 2001). It is also argued that VR provides opportunities for experiential, active learning which encourage and motivate the participant (Mantovani & Castelnuovo, 2003). Furthermore, activity within the environment is safe and strict experimental control may be maintained over stimulus delivery and measurement (Rizzo et al., 1997). Although other literature describes potential challenges of VR (ie clinical acceptance, economic cost, and therapists’ attitudes and comfort levels with technology), initial data from pilot studies are nonetheless encouraging (Burdea, 2003). Katz & Colleagues
(2005) used VR to facilitate safe street crossing in patients with unilateral spatial neglect. On outcomes of unilateral spatial neglect (ie. the BIT Star Cancellation Test and Mesulam), patients receiving VR training achieved results that equaled those achieved by the control group treated by conventional visual scanning tasks (Katz et al., 2005). In addition, patients receiving VR training demonstrated improvement on VR street crossing and on some measures of real street crossing. Another study used VR to train people with stroke how to access and use station facilities of a Mass Transit Railway (MTR), (San Lam et al., 2006). In this study, VR training resulted in significant improvements in patients’ knowledge, skills, and self-efficacy in using the MTR (San Lam et al., 2006).

Another technology topic that relates to persons with stroke is the use of technology to support cognition. According to Katz & Hartman-Maeir (2005), a large number of stroke survivors have cognitive impairments and many others have problems with executive processing. As cognitive and executive processing issues have functional consequences, intervention is often necessary to help people with cognitive disability manage everyday tasks. Over the past decade, computers have become smaller and more powerful, and their usefulness as assistive technology has grown. A growing body of research shows that individuals with cognitive impairment can learn to use portable computers to manage everyday tasks (Carmien, 2002; Kim et al., 2000; Lynch, 2002; Wilson et al., 2001). These devices can improve functional independence, reduce the need for supervision, and empower people to live productive and meaningful lives (Katz & Hartman-Maeir, 2005). Off-the-shelf personal digital assistants (PDAs), designed for business users, have many features that adapt well to individuals with cognitive disability. In particular, reminder alarms tagged to calendar events, prioritized to-do lists, contact information, and memo functions are all powerful compensatory memory tools (LoPresti & Mihailidis, 2004; Wright et al., 2001). At the same time, new products are arriving that are designed specifically for individuals with cognitive disability. For example, The Planning and Execution Assistant and Trainer (PEAT) is a software product for Pocket PC that helps users organize their day. PEAT can recalculate a person’s schedule when situations change, providing a sort of simulated executive function feature that makes it highly flexible (Levinson, 1997). Other portable electronics that may be used as cognitive supports include cell phones, reminder watches, alarm pillboxes, digital voice recorders, pagers, and mini-laptops (Katz & Hartman-Maeir, 2005; Manly et al., 2002; Wilson et al., 2001).

In addition to technological supports for cognition, technology can also be used to compensate for decreased mobility. According to Barker & Colleagues (2004), the use of a cane, walker, or wheelchair may provide persons with stroke the opportunity to be more mobile than would otherwise be possible.
While such technology can certainly be helpful, literature has also suggested there is a period of adjustment that follows the provision of mobility devices in this population. Gitlin & Colleagues (1998) found that patients with stroke often express concerns about social acceptance and personal identity with regard to mobility devices, even though these devices were viewed as providing an opportunity for independence. In another study, Barker & Colleagues (2004) found that pre-stroke lifestyle and values influenced patients’ acceptance of wheelchair use. Such studies suggest that in addition to considering the utility and availability of mobility devices, therapists must also consider patients’ attitudes and perceptions when selecting appropriate mobility technology.

Other areas of stroke research examine the impact of technological devices on motor recovery. One topic receiving attention is robot-assisted therapy, which is the use of robotic devices which physically interact with patients to facilitate movement (Reinkensmeyer et al., 2000). Trials of robot-assisted neurorehabilitation have found that patients who received intensive, robot-assisted therapy experienced greater recovery of arm movement than comparison groups (Lum et al., 2002; Volpe et al., 2000), with some evidence that motor improvements can be maintained at 3-year follow-up (Volpe et al., 1999). In contrast to robotics, electrical stimulation is another technology for facilitating motor recovery in persons with stroke. It has been proposed that neuromuscular electrical stimulation can reduce spasticity, strengthen muscles, and increase range of movement of joints with prevention or correction of contractures (Kralj et al., 1993; Pandyan et al., 1997). Recent studies of patients with stroke have shown that electrical stimulation can facilitate recovery of wrist extensor strength and upper limb function (Powell et al., 1999), as well as manage subluxation and pain of the shoulder (Chantraine et al., 1999; Renzinbrink & IJzerman, 2003).

Prism lenses are another emerging technology described in the stroke literature, particularly in the context of treating patients with left unilateral neglect. Prism lenses cause an optical deviation of the visual field to the right, so that objects appear farther to the subjects’ right than is actually the case (Rossetti et al., 1998). When wearing the lenses, subjects initially misreach to the right. After repeated exposure, however, subjects correct the reach trajectory to accurately grasp target objects, in effect overriding the visual input (Rossetti et al). Prism lenses have been shown to improve aspects of neglect in several studies, acting not only on sensory-motor levels but also on higher cognitive levels of mental space representation and exploration (Rode et al., 2001; Rossetti et al., 1998).

Finally, many persons with stroke experience visual impairments following their injury. Many of the treatment strategies for this group use technology to mediate functional improvement. A common strategy
is the use of optical devices such as hand-held magnifiers to compensate for decreased vision in functional activities. Other strategies include the provision of computer technologies such as WebEyes, which is a software program that enlarges the print of online materials (ION Systems, Inc., 2004). An additional treatment is based on the principles of neural plasticity of the visual cortex and aims at visual field recovery by computerized training. This strategy is trademarked as visual restoration therapy (VRT) by NovaVision (Boca Raton, FL), which began marketing its commercialized therapy program in 2003 for the treatment of visual loss related to stroke and traumatic brain injury (Mueller et al., 2003; Pelak et al., 2007). VRT stems from the observation that repeated perimetry and training of the visual field border can lead to a border “shift” in patients with hemianopia, thus increasing visual field size (Mueller et al., 2003). This non-invasive therapy has been adapted to personal computers so that patients can train at home, and several studies have demonstrated its utility for improving outcomes of vision and ADL (Kasten et al., 2001; Mueller et al).

Clearly, technology plays a role in the rehabilitation of persons with stroke. Much literature has demonstrated that technology can be used by therapists to facilitate treatment and functional outcomes in the clinic. However, it should not be forgotten that technology can be used by patients outside of the clinic to enhance functional performance in everyday life. Given that persons with stroke may benefit from technology, it is important for therapists to evaluate clients’ need for technology. One assessment tool that may assist therapists in selecting appropriate AT for persons with disabilities is the Matching Person and Technology (MPT) assessment process (Scherer, 2005). The MPT assessment is a set of person-centered instruments, all of which examine the self-reported perspectives of adult consumers regarding strengths/capabilities, needs/goals, preferences and psychosocial characteristics, and expected technology benefit (Scherer, 2005). There are also companion provider forms so that consumer-provider shared perspectives can be assessed and to ensure that the evaluation process is a collaborative one. The MPT process enables general technology screening and/or specific technology matching, with specific instruments administered in 15 minutes and the entire battery in 45 minutes (Scherer).

XV. Policy

Older adults with stroke are impacted by several social policies and initiatives. One such policy is Medicare, which is a kind of a health insurance for persons 65 and older, persons under 65 with certain disabilities, and persons with end-stage renal disease (Centers for Medicare & Medicaid Services [CMS], 2007). As nearly ¾ of all strokes occur in persons 65 years and older (Michael & Shaughnessy, 2006), this is an important policy as many individuals with stroke may use Medicare as their primary insurance.
Medicare consists of different sections with each covering separate medical services and items. Medicare Part A covers a person’s inpatient care in hospitals, including critical access hospitals, inpatient rehabilitation, and skilled nursing facilities, but not custodial or long-term care (CMS, 2007). It also helps cover hospice and home health care. Such care must be medically necessary in order to be covered, and there is generally no monthly premium for Part A. In contrast, Medicare Part B covers medical services such as physician visits, outpatient care, preventive services, and other medical care that Part A does not cover (CMS, 2007). Part B is similar to Part A in that covered services must be medically necessary. However, Part B is different in that it comes with a monthly premium in addition to the annual deductible (CMS).

Most people get their Medicare coverage in one of two ways. The Original Medicare Plan is a fee-for-service plan that is managed by the Federal Government (CMS, 2007). In this plan, eligible persons may receive Medicare Part A and Part B, with Part B considered optional for applicants. Persons also have the option to enroll in Medicare Part D for coverage of medically necessary prescription drugs, and the option to purchase a Medigap policy for supplemental insurance coverage. For many individuals, a Medigap policy helps pay for costs such as deductibles or coinsurance not covered in the original plan. Persons who do not enroll in the Original Medicare Plan typically enroll in Medicare Advantage Plans (Medicare Part C). Medicare Advantage Plans are health care plans that are approved by Medicare and run by private companies (CMS, 2007). Medicare Advantage Plans combine a person’s Part A and Part B insurance and typically cover prescription drugs without a person needing to purchase Medicare Part D. Medicare Advantage Plans include Preferred Provider Organizations (PPOs), Health Maintenance Organizations (HMOs), Private Fee-for-Service (PFFS) Plans, Special Needs Plans, and Medicare Medical Savings Account (MSA) Plans (CMS).

Recent literature has examined Medicare trends in the stroke population. Several studies have compared outcomes for older adults with stroke enrolled in HMOs and traditional Fee-for-Service (FFS) plans (Kramer et al., 2000; Monane et al., 1996; Retchin, Clement, & Brown, 1994; Retchin et al., 1997; Smith et al, 1999; Smith et al., 2005). Such studies have suggested that while mortality and rehospitalization rates do not differ across plans, persons enrolled in HMOs have poorer functional outcomes and subsequent community residence rates compared with FFS patients (Kramer et al., 2000; Retchin et al., 1994; Retchin et al., 1997). However, HMO patients with acute stroke also demonstrated lower utilization of services, including shorter in-patient stays (Monane et al., 1996; Retchin et al., 1994) reduced use of in-hospital neurology care (Smith et al., 1999), lower likelihood of discharge to rehabilitation facilities,
and greater likelihood of discharge to skilled nursing facilities (Retchin et al., 1997; Smith et al., 2005). The potential for HMOs to achieve cost savings through substitution of cheaper but “equivalent” post-acute options for traditional care is a recurrent topic in health policy research (Kane et al., 1996; Miller & Luft, 2002; Wheatley, DeJong, & Sutton, 1997). However, the federal government has more recently focused on reducing costs for post-acute care through changes in Medicare FFS reimbursement policies (Cotterill & Gage, 2002). These changes may result in FFS patterns of care more closely mimicking HMO trends as we move into the future (Smith et al., 2005). As such, it is important that practitioners stay up to date with the changing trends in Medicare reimbursement as these changes may affect delivery and provision of stroke care.

Another policy that may impact older adults with stroke is the Older Americans Act of 1965 (Administration on Aging [AoA], 2006). The Older Americans Act has not only been instrumental in creating the Administration on Aging, but it also provides states with grant money for the planning of community research projects and programs for seniors (AoA, 2006). In addition, later amendments to the act provided funds to area agencies on aging for use on local projects and community needs. Examples of specific initiatives and projects include health promotion and disease prevention activities, services for low-income elders, and caregiver support programs (AoA). For older adults with stroke, the Older Americans Act has particular significance as stroke is one of the most common chronic health conditions in the aging population with lasting effects on functional independence and community participation. Given this impact, it is important for survivors to engage in health-promoting behaviors to manage their condition and enhance their recovery. The Older Americans Act can be an important funding resource for practitioners designing community initiatives to promote health lifestyles for persons with stroke. In particular, one issue that can and should be addressed is the promotion of exercise and nutrition to lower one’s risk of future stroke. Such an initiative is important as over 25% of annual strokes are recurrent attacks (Michael & Shaughnessy, 2006). Another possible program is one that provides opportunities for social participation in community activities. Many older adults with stroke have difficulty reintegrating into their communities and may benefit from an organized effort to promote social involvement and networking (Bhogal et al., 2003; Furphy, 2005). Occupational therapists can play an instrumental role in creating and advocating for these programs as community participation is an important aim of the profession.
XVI. Current Trends in Stroke Rehabilitation

The impact of stroke-related deficits on participation in everyday life is rarely the focus of rehabilitation research or practice. Most stroke rehabilitation emphasizes impairments in body structure and function, with many interventions applied with the goal of improving component skills and/or ameliorating deficits. Such trends are particularly evident in occupational therapy for persons with stroke despite the skills and specialty training of occupational therapists in addressing occupational performance and participation issues of everyday life (Bode et al., 2004; Latham et al., 2006; Ma & Trombly, 2002; Occupational Therapy Practice Framework, 2002; Richards et al., 2005; Trombly & Ma, 2002).

The impairment-driven focus of stroke rehabilitation is captured in several recent analyses of occupational therapy clinical practice (Bode et al., 2004; Latham et al., 2006; Richards et al., 2005). Latham & Colleagues (2006) found that clients spent the largest proportion of time engaged in activities that directly targeted remediation of performance skill deficits or body structure/body function impairments (eg., upper-extremity control, strengthening, passive range of motion, postural awareness). Only 40.2% of therapy time was spent on direct practice of daily activities, and only 5% of time was directed at activities to support community integration and leisure (Latham, et al.). Other studies (Bode et al., 2004; DeJong et al., 2004; Richards et al., 2005), reported similar findings with Bode & Colleagues reporting that regardless of impairment severity, occupational therapists consistently spent more time on impairment-focused activities while physical therapists and speech pathologists spent more time on function-focused activities. By contrast, professional definitions generally emphasize physical therapists’ focus on underlying capacity (Illinois Physical Therapy Practice Act, 2004), occupational therapists’ specialty in addressing function (OT Practice Framework, 2002), and speech pathologists’ focus on ameliorating impairment and enhancing functional communication (American Speech-Language-Hearing Association, 2001). This suggests that occupational therapists may have under-utilized skills that may potentially benefit the stroke population if employed in practice.

The above trends are mirrored in occupational therapy research of stroke rehabilitation, with many studies examining primary outcomes of improving impairments and reversing deficit patterns. In two recent meta-analyses of occupational therapy for persons with stroke, studies were classified according to therapeutic endpoints measured in the studies (Ma & Trombly, 2002; Trombly & Ma, 2002). Among the 36 articles reviewed, impairments were measured in the largest number of studies. When activity and participation were outcomes of interest, they were most frequently basic activities of daily living, followed by instrumental activities, and lastly participation in life roles (Trombly & Ma). These findings suggest that
remediation of impairments is a frequent therapeutic goal in many occupational therapy studies of persons with stroke, with participation in everyday life seldom addressed. Many of the studies also employed treatment approaches that were not individualized or functionally-based, again suggesting that everyday life issues are not a primary concern. Examples of such approaches included hierarchical, reflex-driven treatments, rote exercise applied in the context of non-meaningful tasks, paper and pencil re-training exercises, dynavision activities, and positioning protocols (Ma & Trombly). In addition, many of these impairment-focused studies had little mention of generalization to everyday life activities.

Despite the predominant focus on impairment in occupational therapy for persons with stroke, some literature does acknowledge the importance of functional treatment activity, including research directed at newer task-oriented therapies such as constraint-induced movement therapy (Dromerick et al., 2000; Wolf, 2006), and research describing compensatory strategies applied in the context of task-specific education and training (Cicerone et al., 2000; Corr & Bayer, 1995; Drummond & Walker, 1995, 1996; Shah, 2006). Emerging technologies such as virtual reality may also prove beneficial for addressing everyday life issues (Katz et al., 2005; San Lam et al., 2006; Weiss & Jessel, 1998). However, these approaches appear to be under-utilized in occupational therapy clinical practice given that task-specific training is generally not the primary focus (Bode et al., 2004; DeJong et al., 2004; Latham et al., 2006; Richards et al., 2005).

The emphasis on impairment in stroke rehabilitation brings several potential problems to the forefront. To begin, recent statistics are suggesting that even with rehabilitation, significant disabilities are observed in persons 6 months post-stroke when they are typically no longer receiving therapy (Kelly-Hayes et al., 2003). In particular, 50% remain paralyzed on one side, 46% have cognitive deficits, 30% are unable to walk without some assistance, 26% are completely dependent in activities of daily living, 30% have social disability, 35% have depressive symptoms, and 26% are institutionalized in nursing homes (Kelly-Hayes et al., 2003). Even individuals with very mild strokes are reporting persisting difficulties with complex task performance months after the onset of their stroke, despite being discharged with the expectation that they will reintegrate into daily activities without a problem (Duncan et al., 1997; Edwards et al., 2006; Lai et al., 2003). These findings suggest that current rehabilitation is not meeting the needs of many individuals following stroke. Another problem with impairment-focused therapies is the questionable generalization of treatment exercises to functional activities in the client’s everyday life, particularly as contemporary learning theories suggest that learning does not occur in the absence of direct practice and feedback (Polatajko & Mandich, 2004). Recent clinical guidelines suggest the importance of activity-focused approaches in stroke
rehabilitation. The most recent update of the National Clinical Guidelines for Stroke published in the United Kingdom (Royal College of Physicians, 2004) argues for the use of task-specific training over impairment-focused treatments citing that “Emerging evidence is showing advantages of a task-specific training or practice approach over impairment-focused approaches; Giving clients the opportunity to practice tasks is a major element in improved outcomes” (p. 9). Evidence that supports this general guideline is presented by Trombly & Ma in their meta-analyses (Ma & Trombly, 2002; Trombly & Ma, 2002).

XVII. Introduction to a New Model

Among the various rehabilitation disciplines, occupational therapists are in a position to address the existing gaps in stroke rehabilitation as they are trained with the skills to apply occupation-based activity to facilitate function (OT Practice Framework, 2002). The present model aims to shift the focus of stroke rehabilitation from impairment to everyday life by promoting a top-down, client-centered, occupation-based approach. The primary focus in this model is occupational performance and participation in an environmental context, with impairments recognized as the underpinnings of performance. The American Occupational Therapy Association (AOTA) currently identifies participation as the ultimate goal of occupational therapy services (Youngstrom, 2002). This statement is significant as it suggests occupational therapy should support clients’ performance in a variety of roles in everyday life. According to Law (1998), client-centered practice is an important step in giving clients voice and control in the therapy process. It calls for occupational therapy to focus on enabling and empowering clients by giving them a stronger role in shaping their own services and in defining the outcomes they want (Townsend, 1998).

Theoretical considerations to support this model include the Person-Environment-Occupation-Performance (PEOP) model, which states that occupational performance is not just the result of person factors, but rather is a consequence of an interaction between person, environment, and occupation (Baum & Christiansen, 2005). Another theoretical consideration is the International Classification of Functioning, Disability, and Health (ICF), which states that there are life consequences to impairments, and that the environmental context plays a role in mediating and compounding these consequences (WHO, 2001). The present model builds upon these theoretical frameworks to describe a top-down approach to treatment.

The graphical representation of the model is presented in Figure 1 and is titled Enabling Participation in Older Adults with Stroke. Occupational performance and participation have been placed in the center circle to portray the focus of the model, with this area surrounded by a larger circle representing the environmental context in which activity performance will occur. Underpinning the person’s performance
within his/her environment are the intrinsic factors of stroke, with these issues providing a grounding framework from which performance and participation can arise. As the figure suggests, the intrinsic factors overlap and have imperfect boundaries as these issues occur in real life in a very fluid fashion. The model clearly portrays how intrinsic factors provide an interweaving base of support to enable a person’s performance and participation within an environmental context.

Figure 1. Enabling Participation in Older Adults with Stroke Model

XVIII. Measurement Approach

To capture the complexity of stroke, a well-designed measurement approach is needed for assessing the issues faced by older adults with stroke. Such an approach will enable clinicians to obtain the information they need for designing effective treatment interventions. As the emphasis of the present model is occupational performance and participation in an environmental context, the primary measures will focus on these areas during assessment of this population. Such a focus will enable clinicians to promote
client-centered practice as well as embrace the goals of our profession. Measures of occupation and the environment are listed as follows:

Measures of Occupational Performance/Participation

- Activity Card Sort (ACS)
- Canadian Occupational Performance Measure (COPM)
- Observation of the Client Engaging in Occupational Performance

Measures of the Environment

- Explanatory Model Assessment
- Duke Social Support Index
- Likert Scales of Reciprocity and Civic Trust
- Neighborhood Connectedness Scale
- Analysis of Cognitive Environmental Support (ACES)
- Usability in my Home Instrument
- Client Interviews re. Environmental Barriers and Supports in the Community
- Selected Assessments from the Matching Person and Technology (MPT) Assessment Process

While the primary focus of the model is on occupational performance and participation in an environmental context, it is also important to screen for intrinsic issues as these can impact functional outcomes. As such, measures of intrinsic factors are listed as follows:

- Short Blessed Test
- Selected subtests from the Boston Diagnostic Aphasia Examination (BDAE)
- Mesulam Cancellation Test
- Trail Making Test (TMT)
- Executive Function Performance Test (EFPT)
- Dysexecutive Questionnaire (DEX): Self-Rating and Caregiver Rating
- Cognitive Rehabilitation Research Group (CRRG) Apraxia Test
- Center for Epidemiological Studies Depression Scale (CES-D)
• Apathy Evaluation Scale (AES)
• Client Interview re. Self-Concept
• Functional Observation re. Emotional Lability
• Blood Pressure Evaluation
• Heart Rate during Rest and Physical Activity
• Body Mass Index (BMI)
• Action Research Arm Test (ARA)
• Modified Ashworth Scale (MAS)
• 9-Hole Peg Test
• Finger-Nose-Finger Test
• Near and Distance Visual Acuity
• Visual Fields
• Color/Contrast Discrimination
• Faces Pain Scale
• Berg Balance Scale
• Semmes-Weinstein Monofilaments
• Touch Localization
• Warm and Cold Detection Thresholds
• Stereognosis
• Client Interview re. Spiritual Concerns

XIX. Conclusion

Stroke recovery is an ongoing process for older adults involving a complex interaction of many intrinsic and environmental factors. To effectively capture this complexity, clinicians must apply a theoretically-based model to enable the client’s successful participation in everyday life. By shifting the focus of stroke rehabilitation from impairment to everyday life, the present model aims to provide clinicians with the necessary tools to promote performance and participation in meaningful life activities.
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