The LIV Card Sort:

An Investigation of Use Relative to Cognitive and Linguistic Variables

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ABSTRACT

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(Under the Direction of Dr. Nancy Helm-Estabrooks)

Self-determination model, Life Participation Approach to Aphasia, and WHO's International Classification of Functioning are important concepts in developing functional goals with meaningful outcomes for people in rehabilitation after stroke. Individuals with aphasia after stroke can have a difficult time expressing their needs and preferences regarding rehabilitation, an important aspect of these models. The Life Interests and Values (LIV) Card Sort designed for people with aphasia to communicate information important for treatment planning. Individuals with aphasia secondary to stroke can have co-occurring cognitive deficits that can interfere with ability to perform some tasks. This study investigated the relationship between five individuals' cognitive-linguistic profiles and ability to complete the LIV Card Sort (measured with behavioral variables like number of clinician cues). Results of the study suggest that there is a relationship between cognitive-linguistic profile and behavioral variables, yet these deficits do not seem to limit any person from using the Cards.

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I. INTRODUCTION

The Life Interest and Values (LIV) Card Sorting Task is a non-linguistic, binary sorting task that was developed as a tool for gathering information about the life-participation preferences of individuals with aphasia. The cards depict line drawings of over 80 different activities of daily living and pastimes in four categories (everyday life activities, social activities, leisure activities with high physical demand, and leisure activities with low physical demand). The task requires a variety of cognitive skills including, but not limited to, attention and working memory. Aphasia secondary to stroke is often accompanied by additional cognitive deficits. Due to these co-occurring factors, it is unknown who will or will not be able to use this tool. Background of the development of the LIV Cards, the relationship between cognitive abilities and aphasia, and effect of this relationship on the ability to use the LIV Card Sort will be discussed in the following report.

A. Aphasia and Related Disorders

Aphasia is an acquired language deficit, typically resulting from a left cerebral hemisphere stroke in an area referred to as the "Zone of Language." This area is perisylvian and extends from Broca's area located in the posterior frontal lobe, inferior to Wernicke's area located in the posterior superior temporal lobe. The zone also includes the angular and supramarginal gyri of the parietal lobe and two subcortical white matter pathways that connect these areas; the arcuate fasciculus and the superior longitudinal fasciculus. Damage to these areas of the brain can also result in disorders such as alexia, agraphia and apraxia.

Lesions involving subcortical structures that serve as relay stations to and from these areas can result in forms of aphasia typically referred to as “subcortical”.

Aphasia can affect all modalities of language including verbal and written output, comprehension of spoken and written language, and other communication skills such as the use of symbolic gestures. Several disorders can co-exist with aphasia including ideomotor apraxia, apraxia of speech, dysarthria, and forms of agnosia. A common behavioral phenomenon that accompanies aphasia and related disorders is perservation, which is the inappropriate repetition of part or all of a previous response. All of these phenomena can greatly alter the daily life of a person with aphasia.

Depending on the site and extent of the person’s lesion, people with aphasia may have hemiplegia or hemipareses and/or visual field deficits (i.e. homonymous hemianopia or quadranopia). These motoric and visual deficits will lead to difficulty participating in a wide variety of social, leisure, and vocational activities. In sum, he affects of aphasia and the many challenges that can coexist with aphasia can negatively impact the ability of the individual to participate in life activities.

1. Aphasia and Cognition

Despite many studies investigating the relationship between aphasia and intellectual and cognitive functions, the nature of this relationship is still unclear. According to Hamsher (1998), individuals with aphasia are likely to have deficits within one or more of the non-linguistic cognitive domains: attention, memory, visuospatial reasoning, and executive function. It is unclear whether these difficulties are an integral part of the aphasia or a coincidence of anatomy. Hamsher conjectures that if damage in a particular individual’s

brain occurred in an area that was instrumental in both language functions and in non-linguistic domains, aphasia and cognitive deficits would co-occur. Studies that have examined the status of nonlinguistic cognitive skills in people with aphasia have been inconclusive regarding that relationship.

Basso and colleagues (1973) studied the performance on the Raven's Colored Progressive Matrices (RCPM; Raven, 2006) by individuals with right and left unilateral brain lesions. The RCPM is considered a measure of nonverbal intelligence and requires no verbal responses. It does not depend on skilled manipulative activity or subtle differentiation of visuospatial information. Basso et al. administered a series of clinical tests to the participants. All participants completed the RCPM. Brain damaged individuals completed a confrontation test that detected the presence or absence of visual field deficits, tasks included pattern analysis, copying, sorting, and a test of reaction times. All individuals completed the Token Test, a measure of auditory comprehension, to determine the presence of language deficits. Fifty-one of those individuals were diagnosed with aphasia according to results of the Token Test. Those 51 completed a Standard Language Examination Battery used in the Aphasia Unit at the University of Milan in Italy. This Examination confirmed the presence of aphasia and allowed the participants with aphasia to be subdivided into groups based on type of aphasia (fluent, non-fluent, and global aphasia) For individuals with aphasia, the scores of the two language tests showed no correlation with RCPM scores, suggesting that aphasia severity varies independently of intelligence.

Kertesz and McCabe (1975) administered the RCPM (1965) and the Western Aphasia Battery (WAB) to 111 individuals with aphasia and 52 control subjects. Although some subjects did poorly on the RCPM, results indicated no significant linear relationship between

severity of aphasia and performance on the RCPM. The only factors identified as predictors of poor performance were concurrent impaired comprehension and other cognitive deficit (e.g. attention). Interestingly, normal control subjects were able to complete the RCPM without any verbal instruction suggesting that auditory comprehension of directions may not be necessary for completion of the task. Performance varied among participants with aphasia. Some individuals who were "speechless" performed well on the matrices. Overall, the performance of many participants with aphasia was comparable to brain-damaged controls without language impairment. Kertesz and McCabe concluded that non-verbal intelligence as measured by the RCPM is spared in some individuals with aphasia more than others even though their overall aphasia may be more severe.

In 1995, Helm-Estabrooks, Bayles, Ramage and Bryant investigated the relationship between aphasia severity as measured by the Aphasia Diagnostic Profiles (ADP: Helm-Estabrooks, 1992) and a battery of non-verbal cognitive tasks. Thirty-two right-handed individuals with aphasia secondary to left hemisphere stroke participated in the study. Individuals were aged 42 to 81 years, had between seven and 18 years of education, and were between one and 205 months post-onset. The investigators compared performance of matched groups of males and females because some evidence exists that the males and females can differ on tests of "nonverbal" intelligence. ADP aphasia severity scores ranged from 87 (19^{th} percentile) to 129 (97^{th} percentile) with a mean of 103 (58^{th} percentile). Male and female groups did not differ significantly in terms of aphasia severity. The cognitive battery was comprised of a shortened version of the Wisconsin Card Sort Test (WCST; Nelson, 1976), Clock Drawing/ Setting to Command (Feedman et al., 1994), and three Wechsler Memory Scale-Revised (Wechsler, 1987) subtests (Visual Memory Span, Visual

Paired Associates, and Figural Memory). Overall, scores on the cognitive battery had a mean of 54.21 for females and 53.05 for males, just below one standard deviation of the mean for normal adults (a non-significant difference). This study showed that there were no significant correlations between cognitive performance and aphasia severity.

In 2002, Helm-Estabrooks administered eight subtests of the Cognitive Linguistic Quick Test (CLQT) to 13 right-handed left hemisphere stroke patients. Four subtests were linguistic in nature (i.e., personal facts, confrontation naming, story retelling and paragraph comprehension, and generative naming). The other four subtests measured non-linguistic skills (i.e., symbol cancellation, alternating symbol trails, memory for designs, and mazes). As in Helm-Estabrooks et al. in 1995, Helm-Estabrooks (2002) found no significant correlation between linguistic and non-linguistic abilities as measured by the CLQT for the 13 participants in the study.

In 2005, Baldo, Dronkers, Wilkins, Ludy, Raskin, and Kim investigated the relationship between aphasia severity as measured by the Western Aphasia Battery (WAB) and non-verbal problem solving as measured by the Wisconsin Card Sort Test (WCST). Participants were 41 individuals who had experienced a single stroke to the left (35 participants) or right (6 participants) hemisphere at least one year prior to the study. Each individual completed the WCST and the WAB, including the RCPM, and a version of the Block Design test (WAB; Kertesz, 1983). Performance on the WCST correlated with a number of language measures, especially auditory comprehension and confrontation naming scores. Interestingly, unlike results published by Kertez and McCabe (1975), the RCPM (measure of nonverbal intelligence) correlated with language performance. However, the Block Design Test, a test of visual spatial skills, did not.

Hinckley and Nash (2007) administered a modified version of the *Global Aphasic Neuropsychological Battery* (GANBA) to 29 individuals with aphasia. The GANBA consisted of a variety of tasks including Visual Cancellation, Face, and Object Recognition Subtests of the *Rivermead Behavioral Memory Test* (RBMT), the RCPM, *The Developmental Test of Visual Perception,* and the nonverbal auditory recognition task from the *Communicative Abilities of Daily Living* (CADL). Seven of the individuals had a fluent aphasia, and 22 had a non-fluent aphasia. Participants belonged to one of three test groups based on aphasia severity. Results indicated no statistically or clinically significant differences between of fluent and non-fluent groups on the GANBA performance. Like many of the previously mentioned studies, results indicated a high degree of variability on cognitive tasks that was not related to either aphasia severity or fluency category.

From a clinical standpoint, the origins of any co-occurring cognitive deficits in presence of aphasia may be relatively unimportant. More important is the fact that individuals with aphasia may have non-linguistic cognitive difficulties that do affect communication success. These difficulties must be addressed in rehabilitation if treatment is to have subsequent positive functional outcomes. For example, Nicholas, Sinotte and Helm-Estabrooks trained five individuals with aphasia to utilize a computer based augmentative alternative communication program called the C-Speak Aphasia (Nicholas et al., 2005). Participants' levels of cognitive impairment were compared to their ability to use the C-Speak Aphasia for communication. Results indicated that individuals' executive function skills were predictive of their ability to be successful communicators. In contrast, results from language testing, including the Boston Diagnostic Aphasia Examination (BDAE-3) and semantic experimental tasks bore little relationship to performance on the probe task. These

results suggest that cognitive skill levels can explain the difference between individuals with aphasia who learn to be good communicators and those who do not. This finding is an important consideration for effective management of aphasia.

A review of various studies of the relationship between aphasia and cognitive deficits emphasizes show that cognitive deficits do co-occur with aphasia. The ability to complete tasks both in daily life and in clinical settings (as in speech-language therapy) can be affected by the cognitive deficits that co-occur with aphasia. It is possible that cognitive deficits will interfere with an individual's ability to complete the LIV Card Sorting Task.

2. Neuropsychiatric Problems and Aphasia

A number of neuropsychiatric conditions have been associated with the presence of aphasia. Not surprisingly, depression is common among individuals with aphasia (Kauhanen, Korpelainen, Hiltunen, 1999). Reactive depression occurs when an individual has difficulty adjusting to the shock, anger, and confusion that accompanies the loss of, or dramatic change in communication and lifestyle. In other cases, the depression may be a neuropathological product of the site(s) of brain damage, e.g., left frontal lobe. In some cases, when auditory comprehension is dramatically affected, individuals can develop a sense of fear, paranoia, and loneliness. Individuals who have damage to the frontal lobes may not understand the severity of their condition and may be in denial about their change in abilities (Helm-Estabrooks and Albert, 2001).

Of course, neuropsychiatric conditions can affect individuals' life participation. As mentioned earlier, aphasia and the other life altering effects of a stroke can sometimes lead to reactive depression. It is often the case that depression leads to withdrawal from society, and

decreased life participation. Hobbies, occupations, and daily activities can bring meaning to life in many ways, including providing a sense of worth, accomplishment, and therapeutic social interaction. Decreased participation in these activities often leads to further depression, and so the cycle continues. Due to language difficulties, individuals with aphasia may not be able to communicate the way in which diminished life-participation is affecting their mental health. In fact, traditional intervention for depression includes psychotherapy or counseling, much of which occurs through talk. Individuals with aphasia, for whom language deficits are the very root of their depression, may not be able to access this kind of traditional intervention. The Life Interests and Values (LIV) Card Sort can provide a way for individuals to communicate these preferences in the presence of aphasia. It is possible that addressing an individual's life participation, providing opportunities for reengagement in old activities and introduction of new ones, could help reverse the cycle of depression for individuals living with aphasia and reactive depression.

3. The Implications of Aphasia for Everyday Life and Functioning

Aphasia dramatically affects quality of life. After the onset of aphasia a person may have difficulty reading the newspaper, participating in conversations at a social gathering, communicating with friends and family, creating new relationships, reading labels at the grocery store, making phone calls to businesses, continuing a career, and much more. It is often said that aphasia is a family problem. All of the people around the individual with aphasia, including family, friends, and community members, must adjust to the consequences of stroke and aphasia. To quote Shadden and Agan, (2004) "Virtually all the roles and

contracts that define one's sense of identity within the larger society are modified by stroke and consequent aphasia" (p175).

In the past, speech-language pathologists have taken a role in rehabilitating communication functions. According to Shadden and Agan, the effects of language disorder due to aphasia can not be isolated from an individual's greater sense of self and from their participation in society. Speech-language pathologists can take a role in other aspects of life-participation, at least in so far as helping individuals with aphasia communicate, organize, and develop goals based on those needs. For example, an individual may struggle with the forfeit of involvement in family finance, expenditures, etc and wish to resume previous responsibilities. Little language is directly needed for completion of this task. However, the individual may not have a way to communicate this desire to the family. Communication of this need is the first step in the process. The LIV Cards can provide a way for individuals with aphasia to communicate, organize, and create goals related to their needs and desires regarding rehabilitation.

B. Rehabilitation of the Person with Aphasia

For many individuals, aphasia is a chronic condition lasting throughout the person's remaining life, yet rehabilitation programs are not likely to continue for more than a few months post stroke. The main emphasis in stroke management is to medically stabilize the person so they can be discharged from acute care as soon as possible. Those with physical impairments are moved into rehabilitation settings while those with aphasia but without concomitant physical problems will be discharged to their homes. Sarno (1993) referred to this as a "biomedical" approach to healthcare "which leaves little room for the social,

psychological and behavioral dimension of an illness like stroke" (p.323). The biomedical model overlooks the persisting difficulties individuals with aphasia often encounter including changes in sense of self, independence, and participation in life activities.

As mentioned earlier, left hemisphere strokes can result in a variety of disorders and impairments in addition to aphasia. Together these conditions require the attention of a team of rehabilitation experts including occupational therapists, physical therapists, speech-language pathologists, neuropsychologists, and social workers. Each of these professionals performs assessments specific to their discipline and works on goals to improve a particular area of the person's functioning. In this traditional model of healthcare, there may be little communication between professionals about the overall functional goals of rehabilitation; therefore, the approach may be interdisciplinary but not integrated across disciplines. Further, the patient may be allowed little input in the goals being set and the methods used to attain these goals. This lack of communication poses a danger; the professionals may lose sight of the holistic needs of individual. This style of assessment and service delivery can leave a person feeling "splintered" (Hinckley, 2006).

Hinckley (2006) reviewed 20 published books and articles written by individuals who had aphasia following a stroke. She analyzed these 20 works for recurring themes and insights into the experience of living with aphasia following a stroke. This review led Hinckley to conclude that "when rehabilitation is compartmentalized into professionally based territories, it does not facilitate the patient's understanding of the consequences of stroke to them and their lifestyle" (p. 32).

When the rehabilitation plan is not discussed with the individuals receiving services, they are less likely to see the functional benefits of therapy. Moreover, if the individuals

receiving services are not given an opportunity to contribute to the development of their rehabilitation goals, their sense of self and autonomy may diminish. For some individuals, this leads to confusion and frustration in the rehabilitation process. New theories about healthcare delivery suggest that a better approach to developing and implementing therapy goals is that of "self-determination" or "patient autonomy."

C. Self-determination Model of Rehabilitation

Those who endorse a "self-determination" theory of healthcare believe that when individuals are involved in setting their own goals for intervention, they are more likely to be motivated to work toward, and thus more likely to achieve these goals. There is a tendency for healthcare professionals to set goals and make recommendations based on their understanding of the disorder rather than their understanding of the individual and the individual's personal experience with the disorder. In this traditionally "western" model, goals are determined almost entirely by the healthcare provider. The individuals receiving services, having not been involved in the goal setting process, may not understand the purpose of the therapy activities and, therefore, may be less motivated to participate. Sarno (1993) pointed out "The goal of this model is to save lives or cure, and the assumption is that if the patient complies with physicians' orders he or she will be cured"(p. 342).

Another method of health care delivery is the "self-determination" approach. In contrast to the controlling approach to medical care, the "self-determination" approach is one of "autonomy support." In this model the provider takes into account the person's perspectives, provides choices, offers information, encourages self-initiation, provides a rationale for recommendations, and accepts the patient's decisions (Williams, 2000).

Self-determination theory also makes the distinction between an autonomous patient versus a controlled patient. In a healthcare model where the patient is "controlled" the healthcare providers develop all recommendations and goals based on their own opinions and decisions. In the self-determination model of healthcare, because the individual has more autonomy, the individual, the family, and the healthcare provider work as a team to develop goals and implement them. It has been found that healthcare relationships that are set up this way lead to increased satisfaction and better functional outcomes (Williams, 2000).

Self-determination and patient focused healthcare has been successfully instituted in some hospitals. A group called the Toronto Aphasia Advocacy Group and the West Greater Toronto Stroke Network joined in a meeting with The Toronto District Health Council (TDHC) to help make recommendations for improving care for individuals after a stroke. Issues discussed included smooth transitions through the stroke care pathway, the importance of access to services and information, and patient-centered care. Aphasia advocates suggested the use of pictographic and other modified materials for individuals with aphasia, and developed and implemented strategies applicable to various steps of the aphasia rehabilitation process, spanning from acute care to the return to home life (Kagan and LeBlanc, 2002).

Kegan and LeBlanc outlined the process by which the advocacy group initiated policy change toward a more patient-centered and accessible healthcare system for people with aphasia in their community hospitals. However, they did not discuss the outcomes of these changes. The individuals' responses to these changes, whether they in fact felt that their care became more patient centered and accessible, was not reported. To measure the success of a

truly patient centered healthcare model, outcome measures must be obtained from the patients themselves.

As described earlier, individuals with aphasia have difficulty communicating their ideas, wishes, and opinions. An important component of the self-determination model is the communication between clinician and the individual. Because of their communication difficulties, implementing a self-determination healthcare model for people with aphasia is a challenge. This challenge will be addressed again in a later section.

The self-determination model of healthcare outlines a relatively new method for speech-language pathologists that encourages patient centered, functional therapy goals. A model for the classification of disorders that offers an alternative to the traditional "medical model" of healthcare is the World Health Organization's International Classification of Functioning, Disability and Health framework (ICF, 2001).

D. The WHO International Classification of Functioning Disability and Health (ICF)

In 2001, the World Health Organization (WHO) published a revised framework for the classification of disease. This new framework transitioned from being a "consequence of disease" classification system to a "components of health" classification. (Perenboom, and Chorus, 2003). In the ICF model, a number of different components of an individual's functioning are outlined including body functions, body structures, activity participation, and contextual factors. The affected body functions are physiological functions of body systems. In the case of aphasia, language and communication are the affected body functions. Affected structures are anatomic parts of the body (in the case of aphasia, areas of the left hemisphere). Activity is the execution of a task or action by an individual. Participation is

involvement in a life situation (Worrall and Hickson, 2003). Contextual factors include personal factors (e.g., age, socioeconomic class, and attitude) and environmental factors, or factors outside the individual (e.g., community attitudes and access). This relatively new classification system encourages a very different regard for disease and its relationship to the individual. Previous disease classification systems emphasized loss and did not always consider the individual's unique life situation. The ICF highlights the domains that the WHO agreed are important to health and quality of life and how each of these might be affected in each individual. It focuses on the whole person, including environmental and personal factors. The participation and activities component includes the individual's family and community factors.

The ICF is an important development in the classification and rehabilitation of post-stroke aphasia. It encourages clinicians to consider how aphasia may affect other areas of the individual's life. Under this model speech-language pathologists have a responsibility to address communication in the context of any and all of the nine domains of participation including social relationships, civic and community life, domestic life, and self-care etc.

A major component of the ICF framework is the specification of nine major domains of activities and participation. Each of these domains is considered an important part of living a healthy life. Another movement in rehabilitation of aphasia is the Life Participation Approach to Aphasia (LPAA). The ICF is a method for classifying disease; the LPAA is an intervention approach specific to the rehabilitation of persons with aphasia. Like the ICF, the LPAA focuses on participation in life activities. Supporters of the LPAA believe that reengagement in life activities is central to rehabilitation of a person with aphasia.

E. The Life Participation Approach to Aphasia (LPAA)

When aphasia is present, the improvement of specific language skills may be an important component of recovery from stroke. However, concentrating only on improving abilities to perform linguistic tasks (such as word finding, or comprehension or paragraphs) is perhaps too narrow a focus for such a pervasive disorder. Sarno notes "'Recovery' is a psychological perception and should not be confused with an objective evaluation of communication skills" (Sarno, 1995, p328). Aphasia rehabilitation must consider the individual's lifestyle, their goals, and their resulting functional communication needs.

Intervention for individuals with aphasia has been greatly influenced by the adoption of the Life Participation Approach to Aphasia (LPAA). According to the LPAA project group, "LPAA is a consumer-driven, service-delivery approach that supports individuals with aphasia and others affected by it in achieving their immediate and longer term life goals…." (Chapey, Duchan, Elman, et al, 2001 p. 235) According to the LPAA group, aphasia rehabilitation focuses on re-engagement in life. A major goal of the LPAA is to choose objectives for therapy that will directly lead to improved quality of life for the individual and the family. For example, if a person enjoyed eating at restaurants before the onset of aphasia, then an appropriate therapy objective might be working on ordering from a menu. LPAA recognizes that no two people are the same, and therefore no two interventions should be the same. Reengagement in life looks very different from one person to another. One major difficulty in implementing the life-participation approach for people with aphasia is gathering information about the person's preferences towards different life activities in the presence of a communication disorder.

F. The Person with Aphasia – Self-determination, ICF, & LPAA

Hinckley (2006) identified four recurring themes in her reading of published books and articles written by individuals "living successfully" with aphasia secondary to a stroke. One of the four recurring themes she identified was "adaptation of one's perception of one's self." Individuals living with aphasia go through a period of adjustment and redefinition of identity. Since "what we do" becomes a large part of how we define ourselves in this culture, choosing to resume participation in old hobbies, activities, and occupations in addition to establishing new ones can be an important part of aphasia rehabilitation. Another theme found in these publications was the importance of "setting new goals" to help individuals with aphasia to "live successfully" with aphasia. These themes, identified as highly important by individuals with aphasia themselves, are both in line with the concepts of life participation and self-determination. The remaining two themes identified in the review were: the presence of social support and the individuals' taking charge of their own continued communication improvement.

The movement toward a "life-participation" model is recognized as an important positive development in the field of speech-language pathology. The ICF has the potential to encourage broader and more functional improvements across an individual's life and community setting. The self-determination model of service delivery is clearly an appropriate way to create goals that are relevant to the individual's "re-engagement in life." Individuals with aphasia, however, have unique challenges in using many of the materials currently employed in gathering personal information and opinions. The challenges that exist in using these models with individuals with communication disorders call for the development of new

tools and practices for gathering information designed specifically for individuals with aphasia and their unique clinical needs.

G. Current Methods and Tools

A number of published tests and measures are designed to gather information from individuals who have experienced a stroke. There are limitations with many of these tools. Some of these clinical tools, e.g., *Burden of Stroke Scale*, the *Stroke Impact Scale*, the *Sickness Impact Profiles, Stroke Specific Quality of Life Scale*, and the *Barthel Index*, focus primarily on disorder and loss rather than preserved abilities, strengths, and reasonable areas for improvement. These tools quantify what the individual has lost as a result of the stroke. Clinicians need instruments to learn about life activities that elicit positive feelings for individuals with aphasia in order to identify areas that would be highly motivating therapy targets. To truly implement the LPAA and the WHO ICF framework (2001), clinicians must be able to identify individuals' strengths and preferences as something distinct from the effects of their stroke.

Some published tools are designed to be accessible to people with aphasia and have a more neutral or positive approach to assessing abilities. For example, the American Speech-Language-Hearing Association Quality of Communication Life Scale (Paul et al., 2004) is an 18-question survey that uses vertical visual analog scales with pictorial representations as anchors (a smiling face for positive and sad face for negative). Items were designed to measure the extent of the effect on an individual's relationships; communication interactions; participation in social, leisure, work, and education activities; and overall quality of life. This

scale can give a clinician an overall picture of how the individual is doing. However, one limitation is that the items may be too broad to use in identifying specific therapy targets.

Another common method for gathering information about an individual's present state and preferences is through the use of a proxy. A proxy is a third party, usually a significant other, friend or relative, who is assumed to know the individual well. The proxy answers questions in the manner he or she believes the individual would answer them. Though this method is often used, responses obtained through a proxy are often biased (Cruice, Worall, Hickson and Murison, 2005). Cruice et al. administered four quality of life and health related functioning surveys to 30 individuals with aphasia and their proxy pairs. They compared the responses of individuals with aphasia to the responses of their proxy and found that the proxies had a significant negative bias regarding the individual's overall quality of life, health, and vitality. According to the results individuals' and proxies' responses are usually higher for more objective domains such as physical abilities, but clinicians must use caution when using proxy responses for more subjective questions like those about preferences. These results imply that when identifying subjective information such as preferences for life activities (as in the LIV Cards) a friend or family member proxy is not as effective a sources as the individual with aphasia.

H. LIV Card Sort Activity – History and Development

Many of the tools currently available to clinicians are not ideal for development of rehabilitation goals for individuals with aphasia because of their reliance on language, their negative focus, or their broad nature. In order to implement the LPAA, clinicians must be able to gather reliable and valid information from individuals with aphasia about their current

and past participation in life activities. In order to implement the self-determination model of healthcare, clinicians need a tool that can help them build a greater understanding of the individual and facilitate goal setting. The LIV Cards are intended to answer this need.

Haley, Jenkins, Hadden, Womack, Hall, Schweiker (2005) were part of an interdisciplinary team of occupational therapists and speech-language pathologists working in an aphasia intervention program at the University of North Carolina- Chapel Hill. Group therapy is a central component of this intervention program. When a new participant joins the group, it is helpful for the group facilitator to have information about the interests and experiences of the new group member. In addition, information about each participant's priorities and life activities is crucial for successful individual counseling and consultation services (Haley et al., 2005) The interdisciplinary group identified a need for an aphasia friendly tool to help them gather information from individuals who have difficulty communicating. The group considered the ASHA FACS, the *Canadian Occupational Performance Measure*, the *Communicative Effectiveness Index*, the *Quality of communication Life Scale*, and the *Activities Card Sort* (ACS) to serve this need. Most of these tools were too general to achieve the goals set out by the team. The group identified the ACS as the best available instrument to gather specific information about life participation and preferences from individuals with aphasia.

The ACS is a tool designed by occupational therapists (Baum, 2001) to allow individuals describe their instrumental, leisure and social activities. According to the ACS developers, the tool is easily understood. The ACS describes and documents an individuals' retention of their own activities, and fosters the use of meaningful therapy activities. The

ACS helps clinicians see the impact of a disability then work with family and friends to enable activity and social participation (Baum, 2001).

The ACS was used successfully in pilot testing with eight persons with aphasia from the Aphasia Conversation Groups at UNC. These participants represented a variety of ages, ethnicities, genders and educational backgrounds, and had a range of aphasia profiles. Each individual was able to communicate a wealth of qualitative information. Participants were able to communicate which activities were meaningful in their lives, identify future goals, and describe challenges they face (Haley et al., 2005).

Haley et al. concluded, "The tool met all the main priorities identified at the outset" (p. 14). Those priorities were: to gather information about the individuals' life experiences and the activities that were meaningful to them, and to engage the individuals with aphasia as informants (2005). The researchers noted some areas that could be tailored to the specific needs of people with language deficits due to aphasia.

The primary challenge in working with the ACS system identified in this study was the four category sorting system which was difficult for the participants to utilize. Haley et al. modified the task to a two-category, tier sorting system. An additional challenge for people with aphasia concerned the clarity of the concepts depicted on the cards. The ACS cards contain text must be understood to decode the image. Some individuals with aphasia experienced difficulty with reading comprehension. The researchers worked on developing ways these concepts could be depicted without text. The color photographs used in the ACS contain a great deal of visual information with excess background information creating challenges in the presence of attentional deficits. Pilot testing led to the conclusion that many of the pictures had low transparency; it was difficult for some people to identify the activity

depicted. The low transparency of the photographs can be attributed to the fact that the ACS was intended to be a supplement to spoken communication rather than the primary method of communication (Haley et al., 2005, p.4). This pilot testing of the ACS with people with aphasia illustrated the need for an activity inventory card sort system specifically developed for their special needs.

1. Description of the Current Life Interests and Values (LIV) Cards

An interdisciplinary project (speech language pathology and occupational therapy) was funded by the UNC Department of Allied Health Sciences to create a card sort system specifically for people with aphasia to enable them to better communicate their present, previous and preferred life activities. The tool developed through this project is the Life Interests and Values Card Sort system. According to the self-determination theory of healthcare and the LPAA, a person's desires for rehabilitation are central in the treatment plan (Willams, 2000; LPAA, 2001). The LIV Card Sort would allow clinicians to better employ a self-determination model of healthcare by providing a useful tool for clinicians to gather information about individuals' desires for treatment. The LIV Card Sort System is a binary-choice system that employs pictorial representations of a variety of life activities. It provides a structured way for individuals to communicate their preferences to clinicians despite the presence of communication deficits. This information can help the rehabilitation team design intervention goals that have the potential to lead to functional changes in the individual's life participation.

The LIV Card Sort System includes over 80 cards showing line drawings of a variety of life activities. The cards are divided into four sets: everyday life activities, social activities,

leisure activities with high physical demand, and leisure activities with low physical demand. An additional set of cards depicting common emotions is included for communication of more qualitative information about preferences. Participants are asked which category set they would like to discuss first. Following category selection participants are instructed to sort the pile of cards into two piles: things they currently do and things they do not currently do. Participants are then asked to sort the cards depicting things they don't currently do into two piles, activities they want to start doing, and activities they are not interested in starting. Finally the participant is asked to sort the pile of activities they do now into two piles, activities they would like to do more in the future, and activities for they are satisfied with the amount they do. Each category is sorted in this manner.

Once the task is completed, the rehabilitation team, including families and individuals with aphasia themselves, can use the information collected. Pilot work with these cards showed that through this organized self-assessment the individuals would learn new things about their preferences and discover new opportunities of which they were not previously aware.

2. Pilot studies of LIV Card Sort Activity

Pilot testing of the LIV Cards was performed on two individuals. One participant was a 69-year-old man with Borderline Fluent Aphasia. This individual completed a battery of language and cognitive tests. On the Aphasia Diagnostic Profiles, he earned an Auditory Comprehension score in the 75th percentile, Repetition in the 25th percentile, Lexical Retrieval in the 9th percentile, and Alternative Communication in the 55th percentile. His performance on the Raven's Colored Progressive Matrices was 31 out of a possible 36

points. On the five nonlinguistic tasks of the Cognitive Linguistic Quick Test (CLQT, Helm-Estabrooks) all but two of his scores were at or above the cut off for his age range. The two tasks that rely heavily upon executive functions (Symbol Trails and Design Generation) were below the cut-off for individuals his age.

He completed the LIV Card Sort activity and demonstrated adequate comprehension of the instructions and goals of the task. He was able to identify a number of life activities he was interested in, for example cooking, eating out at a restaurant, using the computer, traveling, visiting the library, and home maintenance. A form designed to mirror the questions posed in the card sort activity, was given to the individual's wife to complete according to what she predicted he would answer for each item. Results obtained from the individual and from his wife were compared for agreement.

During this pilot test, the clinicians, the individual, and his family used the results from the task to develop a number of goals to improve life-participation. He then participated in a series of therapy sessions with speech-language pathologists and occupational therapists to address some selected goals. One target activity identified during the LIV Card Sort process was "cooking." Together, the speech-language pathologists and occupational therapists facilitated a cooking activity. First, the team helped the individual find, read, and understand a preferred recipe. The team introduced modified kitchen tools, such as a knife specially designed for a person with hemiplegia and, with support, the individual successfully cooked a dish to share with family and clinicians.

Another therapy activity targeted was "Using a Computer." With some guidance and support from the therapy team, the individual was able to read items on a screen and explore local leisure opportunities including sports, music, and shopping. He was able to use this

newly rehabilitated skill to locate a local delicatessen that he then visited with his wife. The couple returned to the next therapy session with treats from the shop to share with clinicians. In addition to this functional display of the tangible results of his new computer skills, positive life changes were recorded by his wife. This individual was able to accomplish goals developed using the card sort and reengage in a variety of life activities.

The LIV Cards function as a communication tool for individuals with thoughts and desires that are difficult for them to express. As mentioned earlier, the LIV Cards can also be a valuable way for individuals, overwhelmed with the affects of their stroke and aphasia, to organize and prioritize their own thoughts and wishes. The following case describes another individual's experience with the LIV cards and the resulting goals developed. There is a possibility that these are goals she had not been able to identify before systematically surveying her position and preferences with the LIV Cards.

A 45-year-old woman with aphasia participated in pilot testing of the LIV Cards. Administration of the cards resulted in a significant body of information about her hopes and goals for rehabilitation. "Driving" was identified as a primary goal for rehabilitation. Presently, the intervention team is working on arranging the proper evaluations for assessing her safety and learning about available and appropriate adaptive equipment. Completion of the card sort also helped the group identify "attending church" as an important goal for reengagement in life activities. The participant has since attended church and participated in singing hymns with the congregation. "Reading" was identified as an activity that once brought her great pleasure. Intervention targeting reading comprehension was unsuccessful. As a result, the team discussed alternative book reading, and she began to listen to books on CD, at least for the time being.

The LIV Card Sort shows great promise as a clinical tool; it provides a tool to encourage self-determination theory of health care, follows the LPAA model of intervention, and was completed successfully in pilot testing. The LIV Card Sort does require a number of skills to complete, including ability to comprehend direction, ability to get into set, and ability to maintain attention. Because cognitive deficits often accompany aphasia, some people with aphasia may have difficulty completing the task.

I. Skills Needed for LIV Card Sort Activity

Like many goal-oriented tasks, completion of the LIV card sort system draws upon a number of cognitive abilities to achieve successful completion of the task. The five primary domains of cognition are language, attention, memory, visuospatial skills, and executive function. The LIV Cards require skills in each of these domains a different extents.

1. Language skills

Verbal and written expressions are not required for completion of the LIV Cards. The entire task can be completed without any language output from the participant. Reading comprehension is also not necessary for completion of the LIV Cards. The concepts depicted on the cards are transparent without use of text. However, the participant does need some level of auditory comprehension ability. The participant must be able to comprehend the clinician's verbal instructions for the task although these are supplemented by gestural demonstration of the activities when needed. It is also important for the participant to comprehend any feedback or redirects the clinician might give during the task.

It is possible that aphasia severity will have an effect on performance of the task, especially when the individual has a relatively more severe auditory comprehension deficit. As discussed previously in this paper, researchers disagree about the relationship between aphasia severity and performance on non-linguistic tasks. Therefore, although the cards were designed to be non-linguistic, aphasia severity may influence success on the task.

2. Other Cognitive Skills

Though we characterize aphasia as a speech and language disorder, non-linguistic deficits may co-occur. "There is an increasing recognition that the communication problems one observes in persons with aphasia extend beyond verbal deficits and the myriad of symptoms observed are not solely due to a faulty linguistic system" (Purdy, 2002, p. 549)

The demands the LIV Cards put on a person's language abilities are minimal. Other cognitive domains (i.e., attentional skills, memory, visuospacial skills, and executive function skills) are required to varying degrees to complete the LIV Card Sort Activity.

a. *Attention*

Attention is a group of brain processes that allow an individual to select, sustain and orient to presented information. These processes include vigilance, selection, and executive attention. Vigilance is the ability to maintain attention to tasks over time. Selection is the ability to disengage and reengage attention to a different target. Executive attention is the planning and coordinating of multiple task demands. (Helm-Estabrooks and Albert, 2001). The LIV Card Sort requires all of these processes for successful completion. The individual must be vigilant and attend to the task over a period of up to one hour. The individual must

use selective attention to disengage from the previous card to move on to the next card in the sorting process. The individual must use executive attention to interpret the concept pictured on the card while simultaneously making a judgment about that concept.

Research has shown that individuals with aphasia experience decreased attention that affects their ability to perform on tasks compared to normal control subjects (Petry 1994; Tseng, McNeil, and Milenovic 1993). Measures can be taken to ensure minimal environmental distracters (e.g., performing administration in a quite room and the use of black and white line drawings on the cards) however attentional deficits may affect performance on the LIV card sort. Attentional deficits can manifest in a number of ways during completion of the LIV Card Sort Task such as staying on task.

b. Memory

Two primary memory skills are needed for completion of the LIV Card Sort Task: episodic memory and working memory. The individual must have intact memory for past experiences (episodic memory). Research has shown that individuals with aphasia can have co-occurring long term and short-term memory deficits.

In 1993, Beeson, Bayles, Rubens, and Kaszniak administered two verbal learning tests to 14 individuals with left hemisphere stroke and 14 demographically matched non-brain damaged control subjects. Measures of long term and short-term memory were obtained for free recall of the word lists and cued recall. In cued recall, the administrator used the semantic category to cue words that were missed in the first trial. Results indicated that individuals with aphasia exhibit a reduction of verbal long term and short-term memory. Further, greater long-term memory impairment was associated with anterior lesions and

greater short-term memory impairment was associated with posterior lesions. Beeson et al. also found that subjects recalled more word list items with cued recall than with free recall.

Individuals must have adequate working memory to maintain the instructions for the LIV Cards while completing it. Individuals must be able to make the binary choice at hand while decoding the image on the card. Wright and Shisler (2005) cite the general consensus that many individuals with aphasia have limited working memory resources or have disrupted efficiency of resources. Individuals with aphasia and working memory deficits may experience difficulty completing the LIV Card Sort Task. It is possible that some modifications to the administration of the task will be identified and implemented in the future for these individuals. It can be argued that the administration methods of the LIV Card Sort facilitate "cued recall" through linguistic, gestural, and other administrator interactions. This supports the individual in the presence of long-term memory deficits.

In the presence of memory deficits, a participant may struggle with remembering the locations to place cards to indicate their desired response. In extreme cases, they may forget what the goal of the tasks is. However, the sorting locations are labeled with symbols to remind the participant where to place the cards. The participant has access to clinician support throughout the task. Therefore, it is possible that memory deficits will not greatly influence performance on this task.

c. Visuospatial skills

Visuospatial skills are required to see the cards and to recognize the drawings as representations of a variety of life activities. This requires relatively intact visual perceptual and recognition skills. Decoding of the visual symbols on the cards should not be a source of

difficulty. The pictures on each card have been shown to have good transparency for people with and without aphasia (Haley, 2007). Also, the names of each card are written in text on the back of each card and are almost always stated by the clinician. Preserved spatial aspects of visual perception may still be important to the task.

Individuals with brain damage due to stroke can experience some visuospatial deficits in processing. In a 1997 study conducted by Coslett, 30 individuals with single lesions due to stroke and 13 control subjects performed motor and language acts in response to a stimulus presented in either the individual's right or left hemispsace. Motor tasks were a finger tapping and a hand-squeezing task. The language tasks were single word naming, reading, and auditory comprehension tasks. Individuals with lesions in the parietal lobe of either hemisphere performed significantly worse on motor and language tasks when attending to stimuli presented in the contralesional hemispace. This indicates that in the presence of brain damage, spatial aspects of stimulus presentation can affect performance on a task.

The LIV Cards are presented in both the left and right visual fields. Therefore, it is possible that individuals with co-occurring visual field neglect will experience difficulty with attending to and making binary choices. Frank neglect of one side of space is quite rare in individuals with a single left hemisphere lesion. Hemi-inattention can cause similar deficits in visuospatial abilities. If left neglect or hemi-inattention is present, they might not ever choose to place a card in the left hand pile. The ongoing support and guidance from the administrator throughout the task may alleviate visuospatial difficulties.

d. Executive Function Skills

Executive function is described as "the highest level of human cognition…include[ing] the ability to plan, sequence, and accomplish goal directed activities in a flexible manner as demanded by situational and environmental changes" (Albert and Helm-Estabrooks, 2004 p. 149). Some researchers consider control over sustained attention, fluency, and the ability to generate novel responses to be components of executive function abilities (Glosser and Goodglass, 1990). In a 2000 review, Stuss and Alexander report that distinct executive functioning processes, such as verbal fluency and self-awareness, are related to different regions of the frontal lobes. They propose that there is no unitary executive function. Instead, a number of distinct processes converge anatomically in the frontal lobes and make up what we conceptualize as "control functions" (p. 291).

There are a number of specific abilities needed for successful completion of the LIV Cards that rely on executive function skills. The most crucial of these abilities are decision-making, utilization of feedback, self-monitoring, self-regulating, avoidance of perseveration, self-awareness and insight, and metacognition.

Decision-making abilities are required for completion of the task. The individual must make a series of binary choices about both current and previous life participation. As the task progresses, the decision-making demands increase and become more abstract. The individual must then make choices about preferences for future plans and goals. Individuals with lesions in the frontal lobes may have difficulty with decision-making (Volz, Schubotz, and Yves von Cramon, 2006). Some individuals with aphasia may have damage to the frontal lobes, and therefore have co-occurring decision-making difficulties. If an individual had difficulty making decisions due to executive function deficits, administration time could be either very

long if the individual deliberate excessively over each response, or very short if the participant responds impulsively to each item. The participant might also need extensive prompts from the administrator to keep on task and engaged in the process of decision-making.

The individual must be able to utilize feedback from his communication partner to repair his actions in the case of an error or loss of set. Throughout the card sort, the administrator will ask and answer questions about the cards. If participants have difficulty utilizing feedback they may be unable to repair during loss of set, they may have a very short administration time, and they may not respond appropriately to clinician redirects or prompts.

Individuals must also be able to self-monitor and self-regulate to complete the LIV Cards. Individuals must maintain their attention to the task and repair in the case of distraction. They also must be able to monitor the amount of their inconsequential verbal output in order to continue to move through the task. If self-monitoring or self-regulation are problematic for the participants, they might produce a great deal of unrelated or inappropriate speech, or may not respond appropriately to clinician prompts.

Avoidance of perseveration is important for completion of the task. Some individuals with aphasia struggle with perseveration; broadly defined as the inappropriate repetition of an earlier response. Cognitive and motor flexibility allow an individual to avoid becoming "stuck in set." An individual might perseverate by continuing a previous response after an item has been completed. Once the individuals' responses are determined for one item, (card) they must shift to the next, process that information and create a response appropriate for that item. Cognitive inflexibility has been shown to affect performance on tasks for individuals with aphasia (Purdy, 2005). Purdy found, in a 2005 study, that functional use of alternative

communication can be predicted by a measure of cognitive flexibility on the Communicative Activities of Daily Living (CADL). If participants cannot avoid perseveration, their responses may contradict known information. They may have a very short administration time.

A degree of self-awareness and insight is necessary for completion of the task. The individuals must be able to understand their current condition and be able to think realistically about their abilities. Individuals who do not have an adequate and realistic view of their strengths and weaknesses may struggle to develop goals and accept modifications of those goals. For example, an individual who has used a wheelchair since the stroke and wants to resume training for marathons may have difficulty accepting an alternative form of physical exercise as a therapy goal. Lack of self-awareness may result in responses that are unrealistic.

Individuals must have metacognitive abilities that allow them to think about their thinking process. The individual must be able to process and judge his preferences. The person must be able to think, for example, "Do I *want* to begin gardening again?"

J. Purpose of the Present Study

The primary purpose of the present study is to identify linguistic and nonlinguistic cognitive variables associated with ability to use the LIV Card Sort. This information potentially has great clinical value in identifying which individuals will benefit most from using the LIV Cards to set goals and communicate preferences. The LIV Cards task is not meant to evaluate any abilities, only to gather information. Success will be described through a number of behaviors exhibited by the individual and clinician.

The results of the present study will be used to make any modifications to the LIV Cards to make it more usable for individuals or clinicians. Modifications to the LIV Cards for individuals with specific neurological profiles may be suggested to make the tool usable with anyone with aphasia despite other difficulties. Further, the results will be used to lay the groundwork for a treatment study aimed at describing changes in the individuals life participation and quality of life as a result of goals developed via the LIV Card Sort.

K. Hypothesis

It is currently unknown what criteria will determine successful use of the LIV Card Sort Activity. Other researchers have found that executive dysfunction, auditory comprehension deficits, and aphasia severity are predictors of success on tasks such as utilization of AAC, the WCST, and the RCPM.

It is hypothesized that (1) verbal output skills as measured by ADP lexical retrieval scores will not be significantly related to LIV Cards performance as measured by the presence of behavioral variables. The LIV Cards are designed to be aphasia friendly, so little to no verbal output is required for completion of the task. However, (2) auditory comprehension skills may be significantly related to successful completion of the task because some auditory comprehension is needed to understand the task. (3) Planning and other executive function skills as determined by performance on symbol trails, mazes and design generation subtests of the CLQT and the WCST-64 will be significantly related to performance on the LIV Cards. Executive function has been identified as a predictor of abilities on other tasks. (4) Finally, scores on a general measure of intelligence (i.e.,

performance on the PCPM and cognitive profile as determined by non-linguistic subtests of the CLQT) will be related to ability to use the LIV Card Sort Activity.

II. DESIGN OF THE STUDY

A. Population and Participants

The subjects included in the study were five individuals with aphasia due to a focal lesion (or lesions) in the left or right cerebral hemisphere. Individuals with aphasia secondary to dementias, progressive disorders, multi-infarct lesions, and closed head traumatic brain injuries were not included in the study. Aphasia severity for all participants was below the 75th percentile according to scores on the Aphasia Diagnostic Profile (ADP) which was administered within seven days of completion of the LIV Card Sort Activity. All subjects were at least 21 years old and of either gender. Subjects were at least four months post-onset; there was no upper limit of time post-onset. Participants had various education histories. All participants were right handed and were premorbidly fluent speakers of English. All five participants were living in central North Carolina at the time of testing. Three of the participants lived with family members in the community, one lived with family in a retirement community, and one resided in an assistive living facility. All participants had reliable motor response skills as determined by clinical observation. Participants had unaided hearing intact enough to hear instructions in a quiet room. Each passed a hearing screening for 1000Hz and 2000Hz at 40dB. Subjects had sufficient visual acuity, with or without glasses, to discern symbols in the stimulus book of the *Cognitive Linguistic Quick Test*

(CLQT). All were able to get into set to complete subtests of the ADP and CLQT. Demographic information for the five participants is shown in Table 1 below.

Table 1

Demographic Information for Participants

Participant Code	Age	Gender	Time Post-Onset (mos)	Aphasia Classification	Handedness (previous)	Hand Used for LIV Card Sort	Education Hist. (years)	Former Occupation	Living Situation
01	44	M	57	Mixed Non-fluent	R	L	12	Painter	Assistive Living
02	68	M	408	Broca's	R	L	16	Auditor	Retirement Community
03	41	F	4	Borderline Fluent	R	L	14	Office manager	Home
04	60	M	18	Mixed Non-fluent	R	L	14	Did not report	Home
05	77	F	4	Mixed Non-fluent	R	R	12	Truck driver	Home

B. Procedure

1. Clinical Testing

A battery of diagnostic tests and subtests were administered to each participant. First, the *Raven's Colored Progressive Matrices Test* (RCPM; Raven, 1965) was administered. This test consists of 36 items in a color booklet. For each item, the participant is asked to choose the appropriate image from a field of four to complete an abstract design. Selected subtests of the *Aphasia Diagnostic Profiles* (ADP; Helm-Estabrooks, 1992) were administered, including Personal Information, Information Units, ADP Phrase Length, Naming, Auditory Comprehension, and Repetition. These subtests yield an aphasia severity rating, a lexical retrieval score and an auditory comprehension score. Next, non-linguistic subtests of the *Cognitive Linguistic Quick Test* (CLQT; Helm-Estabrooks, 2001) were administered including Symbol Cancellation, Design Memory, Mazes, Symbol Trails, and Design Generation subtests. Finally, the *Wisconsin Card Sort-64* (WCST-64) was administered. For the WCST-64, the participant is asked to sort 64 cards into piles under four key cards. The participant is not informed of the correct sorting criteria and must discover it by using clinician feedback. A category is complete when the participant achieves 10 correct responses in a row. After the participant achieves 10 correct responses, the sorting criteria is changed without notice to the participant. Clinical testing was administered by the author and took up to an hour and a half to complete for each participant.

2. The LIV Card Sort Administration

The LIV Card Sort Activity was administered to each individual in a quiet room within seven days of the initial battery of tests. The cards were administered to all five participants by the same trained clinician. The LIV Cards were never administered by the author, in order to reduce the opportunity for bias. The clinician followed the protocol for the LIV Card Sort (see Appendix A) and provided answers to any participants' direct questions about the cards or the card sort procedures. Clinical judgment was used to make decisions about when to provide cuing and redirects. The clinician provided unsolicited cuing and redirects when she suspected a participant error, when the participant placed the card in a pile that contradicted the verbal response given, and when the participant exhibited a very long pause time (approximately 10 seconds). Standardized cuing procedures were not prescribed for the administration of the LIV Cards for the present study. This is a newly developed tool and it was unknown what kinds and how much cuing and redirection would be necessary for efficient completion of the task. All five LIV protocols were administered by the same clinician, limiting the variability in degree of cuing among the participants.

The administration session was videotaped using two video cameras. Administration of the LIV Card Sort took between 35 and 50 minutes for completion of all four categories and any reliability checks performed. The video recordings were later analyzed for a number of observed behaviors that the researchers believe collectively indicate degree of success on the task. These behaviors included: time to complete task, time to complete each category, number of clinician redirects, number of participant requests for more directions, other errors, suspected presence of loss of set, and suspected presence of perseveration.

Additionally, the researchers define success overall as the ability to complete the card sort task and convey a body of information about preferences for life activities.

The time to complete the task in full was recorded. The time to complete each of the four categories was also recorded. Total time was calculated by adding the time measured for completion of each category therefore omitting time spent for clinician set up and record keeping. The full administration time was segmented into 10-minute intervals and each of the behaviors was tallied and quantified. Presence of perseveration and presence of loss of set were marked as either present of not present (+ or –) for each 10-minute segment. Coding took approximately one hour for each of the five participant's video recordings (total of approximately five hours). Operational definitions of each behavior are listed in Table 2, below.

Table 2

Behavioral Variables, Operationally Defined

Observed Behavior	**Operational Definition**	**Unit of Measure**
Total Administration Time	• Time measured from when clinician begins reading directions until last card is placed	Time 00:00
Time for Each Category	• Time measured from when category name is said by clinician until last card in category is placed	Time 00:00
Clinician Redirects or	• Clinician repeats the pile labels ("do now, don't do now" "and these are things that you do in	Frequency

Probes	your life now") • Clinician repeats the name of a card more than once after a 10 second pause or refers to a card that has been already placed. Cases when clinician reviews more than one card consecutively (as in: clinician reviews all cards sorted thus far to confirm sorting rule and comprehension) is only coded 1 time. • Clinician asks a question that is not simple social language or echoing (serves a purpose of getting more information or clarifying) (e.g. "but do you ever go to parties?") • Clinician clarifies a card (e.g. "writing checks is more like finances, not really writing") • Do not code responses to a direct question from the participant (so as not to code that "error" twice) (e.g. participant asks "what is this one" clinician answers "this is going to the mall." Do not code clinician answer, only code participant request. • Do not code clinician statements "we have another cards that depicts that" when participant mentions an activity that will be	

	referenced on a subsequent card • Do not code statements involved in story telling • After changing card to different "current status" pile i.e. Do now/Don't do now don't code additional task questions	
Participant Requests Questions	• Participant asks a question about a card (e.g. "what's this one?") • Participant asks a question about the process (e.g. "where do I put this?" • Participant changes original response (if this change in response is a result of a clinician question it DOES get coded twice, once for clinician question and once for participant changes mind, because it is thought to be a weightier error due to decreased self-awareness) • Do not code statements/questions involved in story telling (e.g. "I had a boat, do you ever go boating?")	Frequency
Loss of Set	• Loss of set is suspected when the participant stops responding to items	Present or not +/–
Perseveration	• Perseveration is suspected when the participant	Present or not

	has 4 or more consecutive answers with the same response with no additional information, commenting, pauses, or questions.	+/–
Other Errors	• Any errors or behaviors suggestive of "lack of success" that are not otherwise specified in coding rules (e.g. impulsive responding, excessive speech)	Frequency

Data were recorded on a chart (See Appendix C) and analyzed for interrater reliability. To determine interrater reliability, two coders completed Behavior Score Sheets for a random sample of the data (three ten minute intervals). Interrater reliability for the frequency measures (Clinician redirects and Participant questions) was calculated. Frequency ratio was .98 for 12% of the total coded intervals. In the cases when interrater reliability was not 90%, raters discussed their observations until agreement was obtained.

Due to the variable nature of aphasia and cognitive deficits and how these interact in each individual, results from each participant have been described in case study format. The cases include a description of each participant's demographic information, description of the results from cognitive and linguistic testing, and results from the LIV Cards behavioral observation. Behavioral observations were compared to aphasia severity and auditory comprehension as measured by the ADP; attention, memory, and visuospatial skills as measured by the CLQT: intelligence as measured by the RCPM; and executive functioning as measured by the WCST-64. Notable associations within each case and across the cases are described.

III. RESULTS

A.Clinical Testing

All five participants were able to complete the clinical test battery in one day. Results on the Raven's Colored Progressive Matrices Scores (in number of items correct) ranged from 18 to 31 out of 36 possible points. Participants took from 5 minutes and 30 seconds to 21 minutes to complete the task. Results for each participant are shown in Table 3, below.

Table 3

Raven's Colored Progressive Matrices Scores (number of items correct)

Participant	**01**	**02**	**03**	**04**	**05**
Score (out of a possible 36)	18	25	31	27	27
Time	21:00	11:00	5:32	13:01	12:40

Subtests completed on the ADP allowed calculation of the following scores: Aphasia Severity, Lexical Retrieval, and Auditory Comprehension. All participants included in this study had an aphasia severity below the 75th percentile as measured by the ADP. Severity percentiles ranged from 19th to the 73rd percentile. Lexical retrieval Scores ranged from the 9th to the 37th percentile. Auditory Comprehension Scores ranged from 25th to the 99th percentile.

Table 4

ADP Scores

Participant	**01**	**02**	**03**	**04**	**05**
Aphasia Severity (percentile)	30	73	58	19	47
Lexical Retrieval (percentile)	25	25	25	9	37
Auditory Comprehension (percentile)	25	99	91	25	37

Non-linguistic subtests of the CLQT were completed by each individual. Cognitive domain scores could not be calculated with these data. Performance on each subtest can be thought of as a standardized measure of a variety of cognitive skills. Symbol Cancellation scores ranged from zero to 12 out of a possible 12 points. Criterion cut off score, score at which the participant is considered to have performed within normal limits, are 11 for individuals between the ages of 18 and 69, and 10 for individuals between the ages of 70 and 89. Symbol trails scores ranged from three to 10 out of a possible 10 points. Criterion cut off scores for this subtest is nine for individuals between the ages of 18 to 69, and six for individuals between the ages of 70 to 89. Design Memory scores ranged from four to six out of a possible six points. Criterion cut off scores for this subtest is five for individuals between

the ages of 18 to 69, and 4 for individuals between the ages of 70 to 89. Mazes scores ranged from six to eight out of a possible eight points. Criterion cut off scores for this subtest is seven for individuals between the ages of 18 to 69, and four for individuals between the ages of 70 to 89. Design Generation scores ranged from four to nine out of a possible 13 points. Criterion cut off scores for this subtest is six for individuals between the ages of 18 to 69, and 5 for individuals between the ages of 70 to 89. Perseveration scores for Design Generation ranged from zero to five. These results are shown, with reference to criterion cut off scores, in Table 5 below.

Table 5

CLQT Scores with Reference to Normal Criterion Cut Scores

Participant	**01**	**02**	**03**	**04**	**05**
Symbol Cancellation (Possible 12 points)	12 cut off: 11	12 cut off: 11	12 cut off: 11	9 cut off: 11	0 cut off: 10
Symbol Trails (Possible 10 points)	6 cut off: 9	10 cut off: 9	10 cut off: 9	7 cut off: 9	3 cut off: 6
Design Memory (Possible 6 points)	4 cut off: 5	6 cut off: 5	6 cut off: 5	5 cut off: 5	4 cut off: 4
Mazes (Possible 8 points)	7 cut off: 7	8 cut off: 7	8 cut off: 7	6 cut off: 7	7 cut off: 4
Design Generation (Possible 13 points)	4 cut off: 6	8 cut off: 6	9 cut off: 6	6 cut off: 6	6 cut off: 5
Design Generation Perseveration Score	3	2	4	0	5
Number of Sub-tests at or above cut off	3	5	5	2	3

Key: cut off: Criterion Cut Score, performance on a task is considered within normal limits for age if it is at or above the Criterion Cut Score. Age brackets for Criterion Cut Scores are 18-69 and 70-89.

The last clinical test administered to each participant was the WCST-64. Participants' responses were quantified in terms of total number of errors. These were interpreted using

age and education corrected norms and converted to percentile scores. Total Number of Error percentile scores ranged from the 1st to 30th percentile. None of the participants achieved completion of more than two categories; three participants only completed one category (in other words they were able to achieve 10 correct responses but were not able to shift to a new set of sorting rules based on clinician feedback). Participants took between 10 minutes and 10 seconds to 19 minutes and 4 seconds to complete the task. Results for each participant are shown in Table 6, below.

Table 6

WCST-64 Scores

Participant	**01**	**02**	**03**	**04**	**05**
Total Errors (percentile)	1	3	30	1	4
Categories Completed	1	1	2	2	1
Time	17:13	13:47	10:13	14:42	19:04

In summary, cognitive linguistic profiles were somewhat varied. Participants had strengths and weaknesses on all of the clinical tests. However, some trends can be noted in the clinical test battery results. Participants 02 and 03 scored above cut off on all subtests of the CLQT, both had Aphasia severity scores above the 50th percentile (P02=73, P03=58). Participants 02 and 03 had auditory comprehension scores above the 90th percentile. Participant 03 also obtained the highest score on the WCST-64 (30th percentile). However, Participant 02's score was in the 3rd percentile. Participants 01, 04, and 05 scored below the

cut off for two or more subtests of the CLQT had Aphasia Severities below 50th percentile (P01=30, P04=19, and P05=47). Participants 01, 04, and 05 had Auditory Comprehension scores in the 37th percentile or lower. These three also received scores below the 4th percentile for Total Errors on the WCST-64.

Also of note, Participants P03 and P04 were the only two that completed two categories on the WCST-64, meaning they were able to achieve 10 consecutive correct responses and then identify the new sorting criteria and achieve 10 more consecutive correct responses. The other three participants only completed one category. P03 and P04 received the highest scores on the Ravens colored progressive Matrices (P03=31, and P04=27). However, Participant 05 also received a score of 27 on the PCPM. Participants 01 and 02 received scores of 18 and 25, respectively.

B. LIV Card Sort

All five participants completed the LIV Cards in between 38 and 55 minutes. The mean of the Total Times was 47 minutes and 76 seconds with a range of 15 minutes and 45 seconds. Participants 03 and 04 had total times below the mean (P03=42:44, P04=38:51). Participants 01, 02, and 05 took longer than the mean time with 48:55, 53:42, and 54:36, respectively. These results are shown in Table 7.

Occurrence of clinician redirects and participant questions varied widely. The range of the number of redirects given by the clinician was 13 (5-29). Only participant 03 received fewer than the mean number of redirects. The number of participant questions had a range of nine (7-16). Participants 04 and 03 asked the fewest number of questions.

Only one Other Error was noted. This occurred during administration with P03, when the clinician realized that this individual's stroke had occurred very recently. The clinician had been asking the participant about how much she was doing the activities in the past year (a standard cue for administration for individuals who had had their stroke multiple years ago). When it became apparent that the two had had a misunderstanding, the clinician restated the directions, clarified the confusion, and reviewed the previously sorted cards. This exchange was not really an error to be blames on either the participant or the clinician, but it did affect the time to complete the task and the number of exchanges between the participant and the clinician. The author felt that it was important to note its occurrence and therefore it was coded as Other Error. All the components of this interaction were coded as a single Other Error. Results are shown in Table 7.

No examples of loss of set were suspected during administration of the LIV Cards. Perseveration was suspected during administration with Participants 04 and 05. Results are shown in Table 7, below.

Table 7

Behavioral Variables Observed During the LIV Card Sort

Participant	**01**	**02**	**03**	**04**	**05**	**Range**
Total Time	44:34	48:38	39:09	35:20	49:09	13:43
Number of C redirects	18	19	5	16	29	13
Number of P questions	15	10	8	7	16	9
Other Errors	0	0	1	0	0	N/A
Loss of Set	–	–	–	–	–	N/A
Perseveration	–	–	–	+	+	N/A

Key: C: Clinician, P: Participant. Time all presented in minutes:seconds

IV. DISCUSSION

Cognitive and linguistic scores seem to have some impact on an individual's successful use of the card sort, though not markedly so. A discussion of the five participants' cognitive and linguistic profiles and their performance on the LIV Cards follows.

A. Participant Profiles

1. Participant 01

Participant 01 was a 44-year-old male with 12 years of education, 57 months post onset. He lived in an assisted living facility. Participant 01 was originally right handed, but was using his left hand to complete the LIV Card Sort. Aphasia classification was Mixed Non-fluent, as determined by the ADP. His aphasia severity score fell in the 30th percentile and Auditory Comprehension score fell in the 25th percentile, considered in the lower part of the group (below 50th percentile for aphasia severity and 50th or below for auditory comprehension). He scored above normal cut off for three of the five subtests given on the CLQT, his scores for Symbol Trails and Design Memory were below the normal cut off. He completed only one category on the WCST and completed this task in 17 minutes and 13 seconds. He scored 18 on the RCPM, the lowest score of the group. Participant 01 took 44:34 to complete the LIV Cards, the median measurement of total time. He received 18 redirects (the median number of redirects) and asked 15 questions (the second to greatest number of

questions) during administration. No loss of set or perseverations were suspected during administration.

2. Participant 02

Participant 02 was a 68-year-old male with 16 years of education, 408 months post onset. He lived in an apartment in a retirement community with his wife. He was originally right handed, but he used his left hand for completion of the LIV Card Sort. Aphasia classification was Broca's aphasia, as determined by the ADP. His aphasia severity score was in the 73rd percentile and Auditory Comprehension score was in the 99th percentile. His performance placed him in the less severe range (better than 50th percentile for aphasia severity and 50th or above for auditory comprehension). He scored above normal cut off for all five of the five subtests given on the CLQT. He completed one category on the WCST and finished this task in 13 minutes and 47 seconds. He scored 25 on the RCPM, the second to lowest score for the group. Participant 02's total time to complete the task the second longest total time measured in the group. He received 19 redirects and asked 10 questions during administration. No loss of set or perseverations were suspected during administration.

3. Participant 03

Participant 03 was a 41-year-old female with 14 years of education, 4 months post onset. She lived at home with a friend. She was originally right handed but she used her left hand for completion of the LIV Cards. Aphasia classification was Borderline Fluent, as determined by the ADP. She continued to use her right hand to write with a modified pencil.

Her aphasia severity score was at the 58th percentile and Auditory Comprehension score fell in the 91st percentile, placing her in the less severe range. Like Participant 02, she scored above normal cut off for all five of the five subtests given on the CLQT. She completed two categories on the WCST with total error score in the 30th percentile, the highest performance among the participants. She completed this task in 10 minutes and 13 seconds. Participant 3 scored 31 on the RCPM, which was also the highest of the group. Participant 03's total time to complete the task second to the shortest amount of time. She received five redirects and asked eight questions during administration. As mentioned previously, one example of Other Error was noted during administration due to a miscommunication between the participant and clinician about the task. No loss of set or perseverations were suspected during administration.

4. Participant 04

Participant 04 was a 60-year-old female, 18 months post onset. She lived at home with her husband. Participant 04 was originally right handed, but she used her left hand to complete the LIV Card Sort. Aphasia classification was Mixed Non-fluent, as determined by the ADP. Her aphasia severity score fell in the 19th percentile and Auditory Comprehension score was at the 25th percentile, placing her in the lower range of the group. She scored above normal cut off for two of the five subtests given on the CLQT; her scores for symbol cancellation, symbol trails and design generation were below the normal cut off. She completed two categories on the WCST-64 and completed this task in 14 minutes and 42 seconds. She scored 27 correct on the RCPM, the second to highest score in the group. Participant 04's total time to complete the task was the shortest of the group. She received 16

redirects and asked seven questions during administration. No loss of set was suspected during the task. Notably, perseveration was suspected during administration of the LIV Cards.

5. Participant 05

Participant 05 was a 77-year-old male, 4 months post onset. He lived at home with his wife. Participant 05 was right handed and he used his right hand for completion of the LIV Card Sort. Aphasia classification was Mixed Non-fluent, as determined by the ADP. His aphasia severity score was in the 47th percentile and Auditory Comprehension score was in the 37th percentile. These scores placed him in more severe part of the group. He scored above normal cut off for three of the five subtests given on the CLQT, his scores for symbol cancellation and symbol trails were below the normal cut off. He completed only one category on the WCST and completed this task in 19 minutes and four seconds. He scored 27 on the RCPM, which was one of the higher scores of the group. Participant 05's total time to complete the task was the greatest in the group. He received 29 redirects and asked 16 questions during administration, the highest number of both behaviors in the group. No loss of set was suspected during administration. For participant 05, perseveration was suspected during the task.

B. Interpretation

Cognitive and linguistic scores do seem to have some impact on successful use of the LIV Cards. Participant 03 had the least severe cognitive and linguistic profile, finished the

task in a shorter total time, required the fewest number of redirects, and asked the second fewest number of questions. Further, Participant 05 who had a severe cognitive profile relative to the other participants, took the longest to complete the task and had the greatest number of both clinician redirects and participant questions.

Some of the results were consistent with the hypothesized outcomes. (1) Aphasia severity was related to decreased efficiency (success) on the LIV Cards. (2) A Low Auditory Comprehension score a somewhat good predictor of increased number of redirects and cues needed. (3) Higher scores on measures of executive function, especially CLQT subtests Symbol Trails and Design Generation were a good predictor of decreased total time and decreased number of redirects given during the LIV Card Sort. (4) Overall general intelligence as determined by the CLQT was a good predictor of the LIV Behaviors (again, participants with higher scores needed fewer redirects and were less likely to be coded as perseverative). The Raven's Colored Progressive Matrices (RCPM) though, was not a good predictor of the behaviors measured during the LIV Card Sort. This may be because the RCPM is assessing a skill not needed for the LIV Card Sort.

Despite some differences in amount of time to complete task and number of cues needed it appears that cognitive deficits and aphasia severity do not greatly limit an individual's ability to complete the LIV Cards successfully (the range of Total Time was 35:20-49:03, or 13:43). There were no more than 29 redirects for any participant with most participants needing less than 20. Thus, it seems that any person with aphasia can use the LIV Cards in goal setting and information sharing activities with a clinician.

It is possible that other factors not investigated in the present study interact with an individual's ability to successfully complete the LIV Cards task. Some of these factors may

be unrelated to the individual's aphasia and stroke. Personality, lack of motivation for change (seen in our Participant 02 due to a very long post-onset time), age, level of fatigue or alertness, familiarity with similar tasks, and exposure to the various activities depicted in the cards may all be important variables for successful completion of the task.

During completion of the LIV Card Sort, participants would often begin to talk about their experiences and describe aspects of their life. This communication with the clinician in a semi-structured environment is an excellent venue for functional and spontaneous speech-language therapy. Further, it is a valuable relationship builder between clinician and individual with aphasia, possibly leading to greater understanding and trust, both of which are crucial components of a successful clinical relationship. This observation raises the question: Does a longer administration time actually indicate decreased success? It is possible that more storytelling and communication exchange can prolong the administration time. However, it seems that these moments of diversion from the task were important to the clinical relationship and to achieving a greater understanding of the individual's life situation and needs, which is a goal of the LIV Card Sort. Therefore, longer administration time may indicate increased communication success and not decreased success on the LIV Card Sort.

V. CONCLUSION

Analysis of the behavioral data suggests the number of clinician redirects or cues is most descriptive of ease and efficiency (success) with the LIV Card Sort. The results of the present study indicate that individuals' cognitive and linguistic profiles can be used to generally estimate the amount of cueing and redirection individuals will need to complete the LIV Card Sort (e.g., individuals with very low cognitive test and auditory comprehension scores may need more redirections and may take longer to complete the task). More severe cognitive and linguistic deficits do not necessarily limit an individual in their ability to complete the task and convey a clinically useful body of information for use in intervention. In conclusion, any person with aphasia secondary to a left hemisphere stroke, despite cognitive and linguistic deficits secondary to stroke, may be able to benefit from the clinical use of the LIV Card Sort. Analysis of additional participants would provide more conclusive evidence for these claims.

All participants took less than one hour to complete the LIV Card Sort and between five and 18 minutes for each category within the task regardless of their cognitive or language deficits. The length of time for administration is reasonable for a clinic setting. A clinician could divide the task into four parts to easily administer it in four clinical sessions.

VI. LIMITATIONS OF THE STUDY AND IMPLICATIONS FOR FUTURE RESEARCH

One limitation of the present study is the small number of participants (n=5) primarily due to time constraints. This study is a pilot and further testing and recruiting is scheduled. Ideally, this protocol should be administered to 30 individuals or more. As the number of participants increases, it is likely that the cognitive linguistic profiles of the individuals will be more diverse (i.e. the sample would include individuals with both the higher and lower ends of the spectrum of abilities). As some of the cards may be culturally specific, an ideal sample should include individuals from a variety of geographical regions, socioeconomic classes, and cultural backgrounds.

The author believes that the variables measured measures used do indicate a level of success. Since this is not a standardized task many of the responses cannot be judged as correct or incorrect, therefore measurement of success is inherently challenging. Thus, it is possible that additional variables could be included to provide a more complete measurement of success.

Perseveration and loss of set are difficult to code through video observation of the LIV Cards. The choice is binary, providing a 50/50 chance that any given response is intended or not. Further, it is difficult to judge what a “correct” response is. It is possible that instances of loss of set and perseveration occurred more often than noted during video

observation of administration of the LIV Card Sort. For example, in a string of responses Participant 05 answered that he "is driving now." The researchers learned afterward that he was not yet able to have his license reinstated after his stroke. Measurement of the factuality of the objective responses (doing now/ not doing now) is important to determining level of success and can give insight into the accuracy of the more subjective responses (want to start/ don't want to start). More importantly, the identification of phenomena such as loss of set and perseveration during administration is important for successful clinical use. It is key that the clinician is able to identify such moments in order to guide the individual to ensure that responses are accurate and not the result of perseveration or loss of set. Therefore, developing criteria to identify possible loss of set or perseveration, and ways to intervene are an important aspect of the LIV Card Sort Protocol. More investigation in this area is warranted.

Specific modifications to the LIV Card Sort Protocol for individuals with different communication and cognitive challenges should be investigated. During the five administrations presented here a variety of modifications were used. The first and most obvious was the repetition of task directions. The clinician also modified the task by writing key phrases on paper nearby to provide more modalities for communication. Many times, this encouraged increased comprehension and quality of communication exchange. The clinician used clinical knowledge to judge when these modifications would be appropriate. Other modifications may be appropriate for different individuals. Other modifications may be appropriate for different individuals. As the tool is developed further, descriptions of potential modifications and augmentations could be outlined to provide guidelines for clinicians, especially if the LIV Card Sort is to be administered by people who have less

experience working with individuals with aphasia (such as other members of the rehabilitation team).

As mentioned previously, the LIV Cards can encourage valuable therapeutic interactions between individuals and clinicians. At times during these administrations of the LIV Card Sort, individuals with severe difficulties with lexical retrieval and verbal output produced clear and meaningful examples of incidental speech. A study focused on the quantity and quality of this incidental speech is warranted. Results from this study would provide information about how individuals with aphasia can benefit from lucid and emotionally relevant picture stimuli to encourage communication. This could have implications for augmentative alternative communication (AAC), therapy, and patient advocacy.

The LIV Cards could be useful in both individual and group therapy. They depict images with emotional associations and can provide topics of conversation that many different people can relate to. Additional research and development could be focused on designing a variety of therapy activities using the LIV Cards.

The researchers anticipate a subsequent phase of this research project. The responses gathered through administration of the LIV Cards are designed to translate into functional intervention goals to be instituted by the rehabilitation team. In the next phase of this study, these five individuals and any additional participants will be invited to participate in treatment focused on the activities they sorted into the “start doing” and “do more” piles during administration. Additional research regarding outcomes of this intervention will follow.

VII. APPENDIXES

Appendix A: LIV Card Sort: Sorting and Scoring Instructions

Life Interests and Values (LIV): Sorting and Scoring Instructions

(Total estimated administration time: 2-3 hrs)

1. **Introduce activity**

We want to find out what activities are important to you and what kinds of things you do in your life.

2. **Introduce the 4 sets and select <u>activity type</u>**

- *Everyday Life Activities*
- *Social Activities*
- *Leisure Activities that take a lot of physical strength*
- *Leisure Activities that are not as physical*

Which would you like to talk about first?

Start with the set the person identifies and remove all others from the table.

Mark the order of the selected set

3. **Find activities the person <u>does now</u> (column 1).**

Place card with the "check mark" on the person's right and card with the "X symbol" on person's left.

We are going to talk about _____ Activities. For each activity, tell me if it is something you do now in your life. If you do it now, put the card here (check mark symbol card). *If you never do it, put it here (*the X symbol card*).*

Circle "yes" or "no" for do now

Label activities and verify sorting as needed.
Remove the activity cards under "check mark" from the table with the "check mark" card on top

4. **For No Responses: Determine whether the person wants to <u>start doing</u> any of the activities he/she is not doing (column 2).**

Place card with "thumbs up" symbol card on the person's right and "thumbs down" symbol card on the person's left.

These cards all show things you don't do now. Are there any of these things you want to do in the future? If you want to start doing the activities, put them here (point to thumbs up

symbol*). If you do not want to start doing the activities, put them here (*point to the thumbs down symbol).

Circle "Start" or "don't start"

Remove the activity cards from the table with the "thumbs down card" and "thumbs up card" card on top of each pile. ---Note: These can be scored at a later time or scoring checked if necessary---.

5. For Yes Responses: Determine whether the person wants to <u>do more</u> of the activities he/she is doing (column 3).

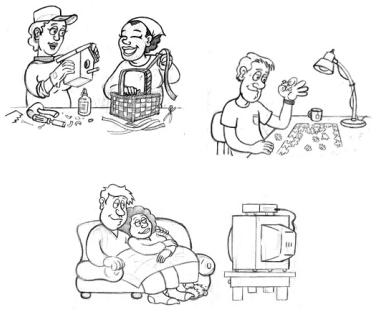
Place card with "an okay hand gesture" symbol card on the person's right and "up arrow" symbol card on the person's left.

These cards all show things you do now. I want to know <u>how much you want to do them in the future</u>. If you feel OK with how much do them now, put them here (point to the okay hand gesture symbol*). If you want to do more of these things, put them here* (card with up arrow*).*

Circle "OK now" or "more"

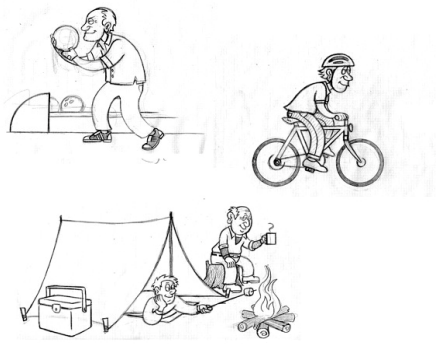
Remove the activity cards from the table with the "okay hand gesture" and "up arrow" card on top of each pile. ---Note: These can be scored at a later time or scoring checked if necessary---.

Appendix B: Sample Artwork from the LIV Card Sort



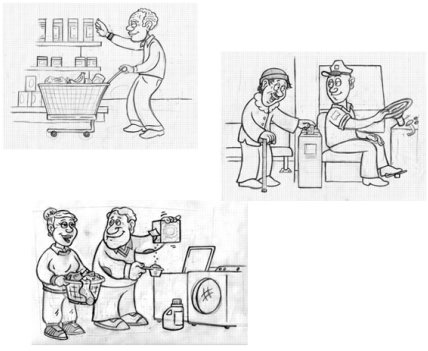
Leisure Activities: Low Physical Demand (LA-lo)

Social Activites (SA)



Leisure Activities: High Physical Demand (LA-hi)

LA-hi: Dancing



Everyday Life Activities (ELA)

ELA: Cooking

Appendix C: Behavior Score Sheet

LIV Card Sort System
Score Sheet: Behavioral Variables During Task Completion

Participant:	
Coder:	
Administration Time	Start: End: Total:

Time ELA	
Time SA	
Time LA-lo	
Time LA-hi	

	0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	Total
Clinician redirects or probes											
Participant requests or questions											
Other errors (e.g. impulsive responding)											
Perseveration											
Loss of Set											

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Appendix D: Table of Results

Participant Code	P01	**Participant Code**	P02	**Participant Code**	P03	**Participant Code**	P04	**Participant Code**	P05
Age	44	Age	68	Age	41	Age	60	Age	77
Gender	M	Gender	M	Gender	F	Gender	F	Gender	M
Time Post Onset	57	Time Post Onset	408	Time Post Onset	4	Time Post Onset	18	Time Post Onset	4
Handedness	R	Handedness	R	Handedness	R	Handedness	R	Handedness	R
Hand used for LIV	L	Hand used for LIV	L	Hand used for LIV	L	Hand used for LIV	L	Hand used for LIV	R
Years of Education	12	Years of Education	16	Years of Education	14	Years of Education	14	Years of Education	12
Former Occupation	Painter	Former Occupation	Auditor	Former Occupation	Office manager	Former Occupation	Not reported	Former Occupation	Truck driver
Living Situation	Assisted Living	Living Situation	Home	Living Situation	Home	Living Situation	Home	Living Situation	Retirement Community
ADP Aphasia Classification		**ADP Aphasia Classification**		**ADP Aphasia Classification**		**ADP Aphasia Classification**		**ADP Aphasia Classification**	
ADP	%ile	**ADP**	%ile	**ADP**	%ile	**ADP**	%ile	**ADP**	%ile
Aphasia Severity	30	Aphasia Severity	73	Aphasia Severity	58	Aphasia Severity	19	Aphasia Severity	47
Lexical Retrieval	25	Lexical Retrieval	25	Lexical Retrieval	25	Lexical Retrieval	9	Lexical Retrieval	37
Auditory Comprehension	25	Auditory Comprehension	99	Auditory Comprehension	91	Auditory Comprehension	25	Auditory Comprehension	37
CLQT (score)		**CLQT** (score)		**CLQT** (score)		**CLQT** (score)		**CLQT** (score)	
Symbol Cancellation	12/12	Symbol Cancellation	12/12	Symbol Cancellation	12/12	Symbol Cancellation	9/12	Symbol Cancellation	0/12
Symbol Trails	6/10	Symbol Trails	10/10	Symbol Trails	10/10	Symbol Trails	7/10	Symbol Trails	3/10

Design Memory	4/6	Design Memory	6/6	Design Memory	6/6	Design Memory	5/6	Design Memory	4/6
Mazes	7/8	Mazes	8/8	Mazes	8/8	Mazes	6/8	Mazes	7/8
Design Generation	4/13	Design Generation	8/13	Design Generation	9/13	Design Generation	6/13	Design Generation	6/13
Design Generation Perseveration	3	Design Generation Perseveration	2	Design Generation Perseveration	4	Design Generation Perseveration	0	Design Generation Perseveration	5
WCST-64		**WCST-64**		**WCST-64**		**WCST-64**		**WCST-64**	
Total Errors (percentile)	1	Total Errors (percentile)	3	Total Errors (percentile)	30	Total Errors (percentile)	1	Total Errors (percentile)	4
Categories Completed	1/6	Categories Completed	1/6	Categories Completed	2/6	Categories Completed	2/6	Categories Completed	1/6
Time	17:13	time	13:47	time	10:13	time	14:42	time	19:04
RCPM		**RCPM**		**RCPM**		**RCPM**		**RCPM**	
score	18	score	25	score	31	score	27	score	27
Time	21:00	time	11:00	time	5:32	time	13:01	time	12:40
LIV Behaviors		**LIV Behaviors**		**LIV Behaviors**		**LIV Behaviors**		**LIV Behaviors**	
Total Time	44:34	Total Time	48:38	Total Time	39:09	Total Time	35:20	Total Time	49:03
#C	18	#C	19	#C	5	#C	16	#C	29
#P	15	#P	10	#P	8	#P	7	#P	16
Other Errors	0	Other Errors	0	Other Errors	1	Other Errors	0	Other Errors	0
Loss of Set	0	Loss of Set	0	Loss of Set	0	Loss of Set	0	Loss of Set	0
Perseveration	0	Perseveration	0	Perseveration	0	Perseveration	P	Perseveration	P

Key: Percentile scores calculated using norms tables from the tests, age and education adjusted norms were used for WCST-64. Time is shown in minutes:seconds. Scores indicated by #/# are participant score / possible points on subtest. ADP: Aphasia Diagnostic Profiles (Helm-Esabrooks, 1992); CLQT: Cognitive Linguistic Quick Test (Helm-Estabrooks, 2001), WCST-64: Wisconsin Card Sort

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Test (Kongs et al., 2000); RCPM: PCPM Colored Progressive Matrices (Kertesz & McCabe, 1975) #C: clinician redirects; #P: participant requests for information.

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