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THE RELATIONSHIP BETWEEN EXECUTIVE FUNCTION AND COPING IN STROKE SURVIVORS

by

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THESIS APPROVAL PAGE

This is to certify that the thesis prepared by Jessica Kegel entitled The Relationship between Executive Function and Coping in Stroke Survivors has been approved by the thesis committee as satisfactorily completing the thesis requirements for the degree Master of Arts in Experimental Psychology.

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Abstract

Stroke affects many individuals worldwide and the impairments can be devastating. Post-stroke sequelae may include physical, emotional, and cognitive impairments. The ways in which stroke survivors cope with such impairments is of great interest, but has not previously been investigated. Previous research in traumatic brain injury (TBI) indicated that executive function is positively correlated with active coping and negatively correlated with avoidant coping (Krpan et al. 2007, 2011). The present study aimed to assess how executive function correlated with coping strategies in another brain-injured sample, stroke survivors. Fifteen stroke survivors completed a battery of cognitive tests measuring executive function as well as the Ways of Coping Questionnaire (WAYS) to assess coping strategies. Results indicated that coping was negatively correlated with avoidant coping *and* a significant predictor of avoidant coping. No relationship existed between executive function and active coping. Implications for future research are discussed.

*Keywords***:** Stroke, executive function, coping

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Introduction

According to statistics collected annually by the Center for Disease Control and Prevention (CDC), approximately 795,000 individuals suffer a stroke within the United States each year (Roger et al., 2010). This staggering statistic makes stroke the third leading cause of death in the United States (Roger et al., 2010). The impact of stroke is not only a national issue; it is of global concern as well. According to the World Health Organization (WHO), approximately fifteen million strokes occur each year worldwide (Mackay, Mensah, Mendis & Greenlund, 2004). While data trends indicate that the death rate related to stroke is declining, the physical and psychological impacts following a stroke can be devastating. For those individuals who do survive a stroke, the recovery process can be a lifelong challenge. Despite the high prevalence of stroke, there seems to be a lack of research on psychological and cognitive sequelae as most of the focus is placed upon physical impairments. The present study investigated the relationship between executive function and coping strategies.

Stroke

Acquired brain injury is a broad classification of any injury to the brain that occurs after birth (National Institute of Neurological Disorders and Stroke, 2011). Acquired brain injuries are categorized as either traumatic brain injuries or non-traumatic brain injuries (NINDS, 2011). Traumatic brain injuries occur as a result of some external force (NINDS, 2011). For example, an injury that may be incurred during a car accident from the force of the brain hitting the skull would be considered a non-penetrating or closed traumatic brain injury (NINDS, 2011). Alternatively, a gunshot wound to the brain would cause a penetrating, or open traumatic brain injury (NINDS, 2011). Non-traumatic brain injuries occur as a result of some internal event or illness (Brain Injury Association of America, 2011). A stroke is an example of a non-traumatic brain injury (BIAA, 2011). The main difference between traumatic and non-traumatic brain injuries is the source of the damage (whether internal or external), however, the resulting damage within the brain and the residual impairments may be quite similar (BIAA, 2011).

A stroke is defined as a neurological event occurring in an area of the brain that restricts blood flow resulting in brain cell death (NINDS, 2011). The two types of stroke are ischemic and hemorrhagic (NINDS, 2011). Ischemic strokes, which account for approximately 80% of all strokes, occur when a blood clot is the cause of blood flow restriction in the brain (NINDS, 2011). The blood clot can either have originated in the brain or have travelled from another area of the body to the brain (NINDS, 2011). Hemorrhagic strokes are less common and result from a ruptured blood vessel within the brain (NINDS, 2011).

Post-stroke Sequelae

Many stroke survivors will suffer some physical, functional, psychological, or cognitive impairment. The level of post-stroke impairment depends upon the location and severity of the stroke. Approximately half of all stroke survivors suffer hemiparesis, or weakness on one side of the body (Roger et al., 2010). Nearly 30% of individuals experience residual gait deficits following a stroke (Roger et al., 2010). Functional disability is also common among stroke survivors. Approximately 26% of stroke survivors are moved to a nursing home as a result of a stroke or become dependent upon their caregivers in Activities of Daily Living (ADLs; Roger et al., 2010). The relationship between physical impairments and functional outcomes post-stroke is most widely researched, but psychological and cognitive impairments are also quite common. One-fifth of stroke survivors experience clinical depression and an even greater number experience an anxiety-related disorder (Haring, 2002). In addition, approximately one-quarter of stroke survivors will develop dementia later in life (Haring, 2002).

Other cognitive impairments, such as attention, language, and executive function deficits occur in approximately 50% of stroke survivors (Haring, 2002). The present study is most concerned with executive function. Executive function is a rather ambiguous term within psychology, but comprises higher-level cognitive functions that manage other cognitive processes (Rabbitt, 2005). It is believed to be a key component in novel situations and in self-regulation (Rabbitt, 2005). Previous research suggests that executive function is primarily a product of the pre-frontal cortex (Rabbitt, 2005). Key features of executive function include reasoning, planning, strategy generation, decision-making, working memory, and judgment (Rabbitt, 2005).

While physical rehabilitation is of great importance, cognitive impairments post-stroke also have a great impact on recovery and quality of life. Knopman et al. (2009) conducted a population-based study of 1,969 individuals, 183 of whom had suffered a stroke. The participants completed an in-person health evaluation and neuropsychological testing assessing domains of executive function, language, memory, and visuospatial ability. Participants with a history of stroke showed a significant decrease in performance in three of the four domains tested: language, visuospatial ability, and executive function; deficits were most robust for executive function.

While Knopman et al. (2009) found the greatest deficit in executive function, another study examined the stability of cognitive deficits over time. Lesniak, Bak, Czepiel, Seniów, & Członkowska (2008) assessed 80 participants within two weeks of having a stroke (acute stage) and one year following the stroke (chronic stage). Participants completed tests of various cognitive domains as well as the Barthel Index to assess quality of life. The researchers found significant cognitive deficits in attention, language, executive function, and memory immediately following the stroke and continued significant deficits in attention at follow-up. While executive function impairments resolved significantly in this sample at follow-up, those with executive dysfunction were seven times more likely still to be functionally dependent at one year post-stroke. Impaired executive function was also the single best predictor of decreased quality of life as reported on the Barthel Index. These studies indicate that there is a strong relationship between stroke and deficits in several cognitive domains, including executive function. Furthermore, executive function impairments have a negative impact on quality of life and functional outcomes in the chronic stage of stroke.

Coping

Given the variety of impairments and the life-altering experience of having a stroke, one might ask, how do stroke survivors cope with these changes? Surprisingly, the research regarding coping among stroke survivors is scarce. Coping is most commonly defined as "Cognitive and behavioral efforts to manage specific external or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus, 1993, pp.237-238). More simply put, coping encompasses the strategies employed by an individual to manage psychological stress. While the classification of coping strategies widely varies, they will be categorized as either *active* or *avoidant* for the purposes of the present study. Active coping strategies are cognitive and behavioral processes that directly address the source of the stressor. Conversely, avoidant coping strategies are cognitive and behavioral processes that displace focus from the source of the stressor to either the feelings and emotions caused by the stressor or other thoughts and activities completely. While many researchers are anxious to term active coping strategies as solely adaptive and avoidant coping strategies as solely maladaptive, there are instances that may contradict this thought. For example, immediately following psychological or physical trauma, it may be beneficial for an individual to employ avoidant coping strategies (Folkman & Lazarus, 1988). Actively confronting the stress immediately following trauma may cause more psychological harm than good. However, in the context of the present study, active coping will be referred to as adaptive and avoidant coping will be referred to as maladaptive. This is because in terms of stroke, avoidant coping has been associated with poor outcomes as demonstrated in the following studies.

Ch'ng, French, and Mclean (2008) conducted a series of six focus groups during which they interviewed 26 individuals who had experienced a moderate to severe (identified using the Modified Rankin scale) stroke at least six months prior. The participants completed the SF-12 (to assess mental and health status) followed by an open discussion of challenges to recovery post-stroke (Ch'ng et al., 2008). Audio recordings of the discussions were transcribed and analyzed to create a set of themes that were pervasive throughout the groups (Ch'ng et al., 2008). The researchers found that the majority of stroke participants indicated that the period after inpatient rehabilitation was the most emotionally, psychologically, and physically challenging (Ch’ng et al., 2008). Participants also indicated that rehabilitation focused almost entirely on physical needs and not enough on emotional needs (Ch’ng et al., 2008). Rumination, depressive symptoms, lack of acceptance, and anger were reported to be pervasive issues post-stroke (Ch’ng et al., 2008).

Lynch et al. (2008) conducted a similar qualitative study in which they interviewed nine stroke survivors and six caregivers in two separate focus groups to discuss important contributions to quality of life following stroke. Transcribed audio recordings were analyzed to assess the prevailing themes in the focus groups (Lynch et al., 2008). Stroke survivors (Lynch et al., 2008) identified lack of social support, decreased communication and loss of independence as having a particularly negative impact on stroke recovery. Caregivers most frequently indicated role changes (i.e. inability to work, loss of leisure activities and hobbies, etc.) as having the greatest impact on quality of life, however, the stroke survivors themselves were reluctant to discuss these changes, indicating a potential lack of acceptance (Lynch et al., 2008). Conversely, stroke survivors did discuss the importance of maintaining a positive attitude and shifting focus from the negative aspects to the positive aspects of their stroke (Lynch et al., 2008).

This line of research demonstrates the importance of coping with the outcomes following a stroke. As mentioned previously, post-stroke sequelae may include a range of physical, psychological, and cognitive impairments. However, there may be a link between executive function and one’s ability to cope effectively with the sudden changes brought about by stroke.

The Relationship between Executive Function and Coping

The relationship between executive function and coping has been investigated in other neurologically impaired groups. Krpan, Levine, Stuss, and Dawson (2007) examined the relationship between executive function and coping in a sample of traumatic brain injury (TBI) survivors. Twenty-one participants with a history of non-penetrating TBI and fifteen control participants completed the following assessments: Alpha Span, Brown-Peterson Procedure, Stroop Test, Wisconsin Card Sorting Test (WCST), and the Revised Strategy Application Test (R-SAT) to assess executive function and the Ways of Coping Questionnaire-Revised (WOC-R) to assess coping strategies. Researchers found a positive correlation between executive function performance and adaptive problem-focused coping ($r = .621$, $p<.05$) as well as a negative correlation between executive function performance and maladaptive escape-avoidant coping ($r = -.501$, $p < .05$). Krpan et al. also performed hierarchical regression analyses with estimated pre-morbid IQ on the first step, injury severity on the second step, and an executive function composite score on the third step; the researchers found that executive function was the greatest predictor of planful problem-solving, contributing 29% unique variance to the overall model. However, executive function was not a significant predictor of escape-avoidant coping. Given the relationship between coping and executive function in TBI, this line of research may be of interest in other brain-injured groups, such as a stroke population.

The Present Study

Previous research indicates a relationship between executive function and coping in TBI samples. Given some similarities between TBI and stroke impairments, the purpose of the present study was to identify the relationship between executive function and coping within a stroke sample. The aims of the study were to:

1. Examine the correlation between executive function and coping in stroke survivors.
2. Determine if executive function predicts the use of certain coping strategies.

Based on the previous research in TBI, executive function was predicted to positively correlate with adaptive coping strategies and negatively correlate with maladaptive coping strategies. In addition, executive function was hypothesized to be a significant predictor of active coping. The present study was approved by the University of Maryland, Baltimore Veterans Affairs Medical Health Center (VAMHC), and Towson University IRBs. All research activities took place within Baltimore VAMHC facilities.

Participants

Fifteen participants were recruited through a research pool database at the Baltimore VAMHC. Participants ranged in age from 36 to 80 years (*M* age = 60 years, *SD* = 11). The sample was 60% female and 40% male with an average education level of 13.8 years (*SD* = 1.9). All participants were in the chronic stage of ischemic stroke (greater than six months since the date of the stroke) with an average of 5.6 (*SD* = 3.3) years since date of stroke onset. All participants had sufficient language and neurocognitive functions to complete necessary testing. Participants were screened for dementia as well as depression prior to entering the study. Participants were excluded for any hospitalizations within six months prior to entering the study. Study coordinators conducted all screening procedures as well as the informed consent process.

Procedure

Participants completed baseline testing prior to entering one of three longitudinal studies examining the effects of different exercise rehabilitation programs (aerobic exercise, group exercise, resistance training, or stretching). Test administration took place in a private, quiet room specifically designated for neurocognitive testing at the Baltimore VA Annex building. Participants received a brief overview of the purpose of the research and a description of the testing. The test administrator answered any questions the participant may have before testing began. Participants then completed a coping questionnaire followed by an extensive series of neurocognitive assessments. The specific tests used for the purposes of this study are described below. The test administration lasted approximately three hours, however, breaks were provided as needed to minimize fatigue.

Materials

Executive Functioning. Participants first completed two subtests from the *Delis-Kaplan Executive Function System* (D-KEFS; Delis, Kaplan & Kramer, 2001). The Color-Word Interference subtest assessed cognitive inhibition. Part one required participants to say the color of different blocks presented on a page. Part two required participants to say the words (names of colors) presented on a page as fast and accurately as possible. Part three required participants to say the color of the ink the words are printed in and *not* read the words. Part four required participants to say the color of the ink the words are printed, *unless* the word is in a box, in which case the participant read the word. Parts one and two had a time limit of 90 seconds, while parts three and four had a time limit of 180 seconds. Next, participants completed the Card Sorting subtest.

Participants were shown a set of six cards that have several elements on them (*e.g.* words, shapes, lines, etc.). Participants then sorted the cards into two groups with three cards in each group. The cards in each group must be similar in some way. Participants continued to sort the cards until they were unable to identify new sorts or they reached the time limit of 240 seconds.

The Trail-Making Test, Part B measured set-shifting (Partington & Leiter, 1949). Participants connected circles containing numbers and letters (Partington & Leiter, 1949). They alternated (or cognitively shifted) between the numbers and letters. If an error was made, participants were stopped, redirected to the circle prior to the error, and instructed to continue on to the next letter or number in the sequence. Scores of interest included completion time (longer times indicate impairment) and the number of errors.

Participants then completed the Letter-Number Sequencing (LNS) test, a measure of working memory (The Psychological Corporation, 1997). The test administrator orally presented a sequence of numbers and letters and participants repeated the sequence such that numbers were said first, ordered from smallest to largest followed by letters ordered alphabetically. The length of the sequences increased from two to eight. The test administrator discontinued the assessment if the participant answered two sequences of the same length incorrectly.

Finally, participants completed the Paced Auditory Serial Addition Test (PASAT; Gronwall, 1977), which assessed monitoring and updating of information in working memory. Participants listened to an audio recording that presents a series of numbers. They took the first two numbers, added them and verbally indicated their answers. Then, they added the next number to the number immediately preceding it on the audio recording and verbally indicated their answer (being careful *not* to give a running total). Participants continued this process until the end of the audio recording (which included 60 items). Two trials of the PASAT were administered, one in which the numbers were presented every three seconds (PASAT 3") and the other in which the numbers were presented every two seconds (PASAT 2"). Sixty was the maximum possible score on each trial.

Coping. The Ways of Coping Questionnaire (WAYS; Folkman & Lazarus, 1988) is a self-report inventory of coping strategies employed during stressful situations. Participants were instructed to think of the most stressful situation that occurred in the past week and endorsed each of the 66 statements to the extent that each statement applied to the situation using a four point likert scale. The WAYS produced eight subscales of coping strategies: Confrontive Coping, Distancing, Self-Controlling, Seeking Social Support, Accepting Responsibility, Escape-Avoidance, Planful Problem Solving, and Positive Reappraisal. While participants completed all 66 questions, the Escape-Avoidance and Planful Problem-Solving subscale scores were the primary scores of interest for the present study. Higher scores indicated greater use of the specific coping strategy.

Results

Coping

The means and standard deviations of the eight coping subscales are presented in Table 1 below. Larger numbers indicated greater use of a coping strategy.

Table 1

Average scores on Ways of Coping Questionnaire Subscales

Variable	*Mean (SD)*
Positive Reappraisal	10.40 (6.16)
Self-Controlling	10.13 (3.94)
Planful problem-solving	9.67 (3.62)
Distancing	8.60 (3.27)
Seeking Social Support	7.87 (3.56)
Escape-Avoidance	7.27 (5.64)
Confrontive Coping	5.73 (2.60)
Accepting Responsibility	4.60 (2.95)

Independent samples t-tests were performed to compare the coping scores of the stroke sample in the present study to the TBI sample in previous research (Krpan et al., 2007). The stroke sample had higher scores on average on all of the eight subscales than the TBI sample. Two of the eight subscales were significantly different between groups: Positive Reappraisal ($t = 3.23$, $p < .05$) and Distancing ($t = 2.52$, $p < .05$). The remaining subscale scores were not significantly different between the TBI sample and the stroke sample ($p > .05$).

Executive Function

The executive function assessments scores were all converted to T-scores ($M = 50$, $SD = 10$). For most of the executive function assessments, the mean scores fell within the average to below average range (see Figure 1 below). The PASAT 3” ($M = 23$, $SD = 9$) and the PASAT 2” ($M = 28$, $SD = 7$) scores were significantly lower than scores on the other assessments.

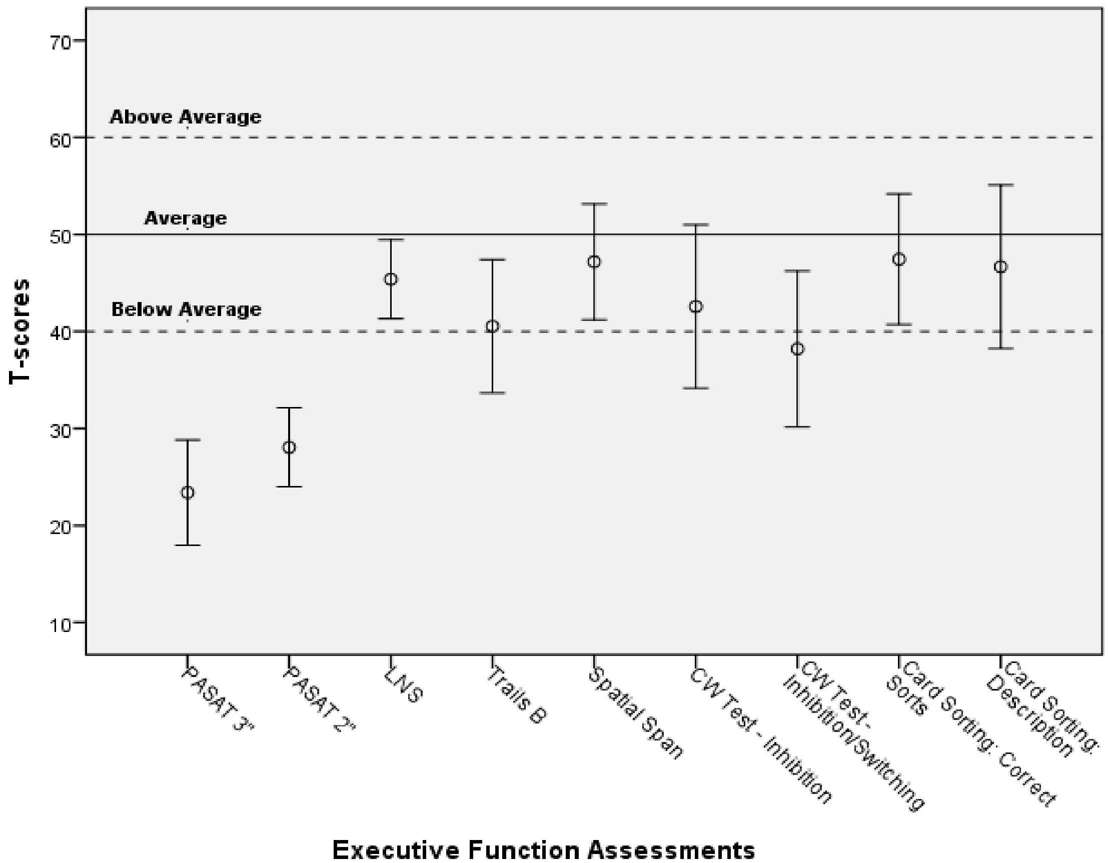

Figure 1. Error bar graph of executive function assessment T-scores

Coping and Executive Function

The data were first examined for outliers and none were detected on the boxplots. Because of the small sample size, Spearman's *rho* rank correlations were used. Coping strategies and executive function variables were first correlated with participant characteristics to identify potential confounding factors. Gender was largely correlated with several variables (see Table 2 below). To account for this potential confound, gender was controlled for in all subsequent analyses using partial rank correlations (statistic was Spearman's *rho*).

Table 2
Correlations between gender and other variables

Variable	*R*
Escape-avoidance	-.650 ($p < .05$)
Letter-Number Sequencing	.718 ($p < .05$)
Trails B – A	-.647 ($p < .05$)
Trails B errors	-.685 ($p < .05$)

The results of the partial correlations indicated that escape-avoidance was related to several of the executive function assessments (see Table 3 below). As PASAT scores and LNS scores decreased, the use of escape-avoidance significantly increased. While several scores did not reach significance, the effect size for Trails B and Trails B errors is worthy of noting ($r = .503$, $p < .096$). As Trails B time and number of errors increased (indicating worse performance), the use of escape-avoidance increased.

Table 3
Partial correlations between escape-avoidance and executive function

Variable	*R*
PASAT 3”	-.739 ($p < .05$)
PASAT 2”	-.698 ($p < .05$)
Letter-Number Sequencing	-.687 ($p < .05$)

Planful problem solving was not significantly correlated with any of the variables ($p > .05$) and therefore was excluded from the remaining analyses.

Using the significant variables from the partial correlations, a composite executive function score was created to reduce the possibility of spurious results. The same relationship emerged between escape-avoidance and the composite score ($r = -.801$, $p < .05$). Next, a linear regression was performed to identify significant predictors of escape-avoidance (see Table 4 below). Given the large correlation between gender and escape-avoidance, gender was included on the first step and the executive function composite score was included on the second step of the equation. The results indicated that gender was a significant predictor of escape-avoidance and contributed approximately 45% variance. Males were more likely to engage in escape-avoidant coping than females. Executive function also was a significant predictor of escape-avoidance and contributed approximately 22% unique variance. Individuals with decreased executive function performance were more likely to engage in escape-avoidant coping. With the addition of executive function on the second step, gender was no longer a significant unique predictor of escape-avoidance ($p > .05$).

Table 4

Gender and executive function composite score as predictors of escape-avoidance

Model	Variables	Beta Weight	Model Significance	R^2	$R^2 \Delta$	$R^2 \Delta$ Significance
Model 1	Gender	-.673	$p < .05$	.453	.453	$p < .05$
Model 2	Gender EF Composite Score	-.386 -.549	$p < .05$	.672	.219	$p < .05$

A second linear regression was performed using the individual executive function assessments as predictors of escape-avoidance (see Table 5 below). The results indicated that the executive function assessments contributed approximately 32% variance in escape-avoidance, though the change in R^2 was not significant ($p > .05$).

Table 5

Gender and individual executive function assessments as predictors of escape-avoidance

Model	Variables	Beta Weight	Model Significance	R^2	$R^2\Delta$	$R^2\Delta$ Significance
Model 1	Gender	-.673	$p < .05$	.453	.453	$p < .05$
Model 2	Gender	-.252	$p < .05$	.771	.318	$p > .05$
	PASAT 3”	-.571				
	PASAT 2”	-.707				
	LNS	-.553				

Discussion

The purpose of this study was to analyze the relationship between executive function and coping in stroke survivors. Based on research in a previous TBI study, it was hypothesized that executive function would be positively correlated with adaptive coping (planful problem solving) and negatively correlated with maladaptive coping (escape-avoidance; Krpan et al., 2007). Furthermore, executive function was hypothesized to be a significant predictor of active coping. The results partially supported these hypotheses. Executive function was negatively correlated with escape-avoidance. As executive function performance decreased, the use of maladaptive coping strategies increased. Interestingly, there was no relationship found between any measure of executive function and adaptive coping. This was unexpected as previous TBI research has shown executive function was a significant predictor of planful problem solving and *not* a significant predictor of escape-avoidance.

A simple explanation for this finding may be that some of the assessments used in the present study were different from those used in the TBI study. However, the assessments used in both studies were sensitive to the same areas of executive function (e.g. working memory, set-shifting, novel/abstract thinking). Another possibility could be differences between the samples in regards to coping strategy scores and executive function performance. In terms of coping, there were no significant differences in either planful problem solving or escape-avoidance between the TBI sample used in previous research (Krpan et al., 2007) and the stroke sample in the present study. Executive function performance within the stroke sample fell mostly in the average to below average range with the exception of PASAT 3” and PASAT 2” scores, which fell significantly below the other assessment scores. Executive function characterization was not provided for the TBI sample; therefore, a comparison between executive function performance cannot be made between that group and the stroke sample in the present study.

Another unexpected finding was the relationship between gender and avoidant coping. Males engaged in higher levels of escape-avoidance than females. This relationship between coping and gender was not present in the TBI study (Krpan et al., 2007). The TBI sample in the previous study consisted of approximately 66% females and 34% males, while the stroke sample in the present study consisted of approximately 60% females and 40% males. Therefore, the gender composition of each sample did not seem to drastically differ. Folkman and Lazarus (1980) found gender differences in coping strategies in an early psychometric study of the Ways of Coping questionnaire. The researchers examined the effect of individual characteristics on coping in a sample of 100 relatively healthy participants ranging in age from 45 to 64 years of age. The researchers found that women were more likely to report health-related stressors and men were more likely to report work-related stressors. Correlational analyses revealed that active coping strategies were more likely to be employed in work-related stressors and avoidant coping strategies were more likely to be employed in health-related stressors. The researchers point out that while it may seem that there were gender differences in coping, the distinction in coping strategies lied within the type of stressor reported. When the source of the stressor was controlled for, gender was no longer correlated with coping ($p > .05$). It may be of interest in future studies to examine the type of stressor reported by participants to determine if the gender difference in coping persists.

Other limitations of the present study include the small sample size, which makes it difficult to generalize the results. Also, little information regarding stroke location was available for the stroke sample in the present study. Future studies may consider examining potential relationships between stroke location, cognitive impairments, and coping. Despite these limitations, the results of this study indicate that there is a strong relationship between executive function and coping; specifically, decreased executive function is correlated with and predictive of increased maladaptive, or avoidant coping.

Stroke is a leading cause of disability within the United States and residual impacts can be detrimental to the body and mind of a stroke survivor (Roger et al., 2010). As age is a major risk factor, the prevalence of stroke will continue to rise as the population ages (NINDS, 2011). The present study provides a novel finding on the relationship between executive function and coping within stroke survivors. As previously reported, coping is an important factor in outcome post-stroke. Therefore, it is of great importance to make the rehabilitation process as efficient and effective as possible. Research in rehabilitation programs indicates that aerobic exercise may be promising in terms of improving impairments. For example, Colcombe and Kramer

(2003) conducted a meta-analysis of 18 studies that examined the effects of aerobic exercise on various cognitive functions in older adults. The researchers found that aerobic exercise significantly increased cognitive performance in all of the tested domains, but the greatest increase occurred in executive function performance. In another study, Colcombe et al. (2004) explored how aerobic exercise affected brain activation. Twenty-eight relatively healthy older individuals were randomized to either an aerobic exercise intervention (experimental group) or a non-aerobic, stretching intervention (control group) for a six-month duration. Functional magnetic resonance imaging (fMRI) analyses indicated that the experimental group experienced increased activation in the frontal and parietal brain regions following the six-month aerobic intervention than the control group. These studies demonstrate that aerobic exercise may increase brain activation and improve cognitive function, especially executive function. If executive function can improve as a result of aerobic exercise, future research should examine if such an intervention has any effect on coping strategies. Perhaps another avenue to investigate is if the inclusion of cognitive training or training in effective coping coupled with exercise programs would provide even greater effects. The implications of rehabilitation on executive function impairments and coping must be examined further in a stroke population to ensure the best possible outcomes for stroke survivors.

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Spreen, O. & Benton, A. L. (1969). *Neurosensory Center Comprehensive Examination for Aphasia (NCCEA).* Victoria: University of Victoria Neuropsychology Laboratory.

Curriculum Vita

Jessica L. Kegel

Education

Masters of Arts Degree, Experimental Psychology
August 2011 – May 2013 (Expected Graduation Date)
Towson University

Bachelor of Arts Degree, Psychology
August 2003 – December 2008
University of Maryland, Baltimore County (UMBC)

Professional Experience

Clinical Research Assistant, University of Maryland Medical Center, Baltimore, MD
September 2010 – Present

- Complete neurocognitive assessments with stroke victims suffering cognitive impairment at the Baltimore VA Medical Health Center
- Set up and conduct ECGs for autonomic assessment (eg. Heart rate variability)
- Administer an affective stressor (eg. Anger recall interview)
- Assist in IRB regulatory maintenance for multiple protocols
- Schedule research subjects and answer questions regarding studies
- Complete literature searches and write executive summaries
- Database creation, data entry maintenance, and data analysis using SPSS
- Assist with submissions for conference presentations

Clinical Research Coordinator, Clinical Insights, Glen Burnie, MD
September 2009 – September 2010

- Coordinated neuropsychopharmacological clinical trials
- Administered and scored neurocognitive assessments
- Maintained drug accountability and dispensed investigational drugs
- Managed IRB submissions for ongoing and upcoming studies
- Communicated effectively with study patients to facilitate their understanding of study procedures
- Upheld office standard operating procedures to ensure protocol adherence and HIPAA compliance

Clinical Research Assistant, Clinical Insights, Glen Burnie, MD
December 2008 – September 2009

- Assisted research coordinators in neurospychopharmacological clinical trials
- Administered assessments and evaluations to study patients
- Maintained drug accountability and dispensed investigational drugs
- Completed electronic case report forms and reconciled data queries

Research Assistant, Clinical Insights, Glen Burnie, MD
August 2008 – December 2008

- Participated in trainings for neuropsychopharmacological clinical trials
- Completed electronic case report forms and reconciled data queries
- Assisted with the preparation and presentation of lectures on Geriatric Depression

Related Experience

Independent Reading in Psychology, UMBC, Baltimore, MD
September 2008 – December 2008
Dr. Lowell Groninger, PhD, Department of Psychology

- Under the direction of a faculty member, developed my knowledge of Alzheimer's Disease through independent research
- Completed a research paper analyzing the effects of stress and sleep deprivation and their possible attribution to the neurological and cognitive decline associated with Dementia of the Alzheimer's type

Research Assistant, UMBC, Baltimore, MD
September 2008 – December 2008
Dr. Lynanne McGuire, PhD, Department of Psychology

- Studied the effect of psychological interventions on the physiological aspects of pain
- Met with subjects and conducted the pain testing experiment
- Administered blood pressure readings and assisted with obtaining saliva samples
- Recorded data and any deviations from the protocol

Research Assistant, UMBC, Baltimore, MD
September 2007 – December 2007
Dr. Lowell Groninger, PhD, Department of Psychology

- Studied the roles of word recall and face recognition in learning and memory
- Scheduled appointments with participants for the “Learning and Memory of Faces and Names” experiment
- Met with subjects and conducted the two-part study
- Scored and entered experimental data into SPSS