

THE IMPACT OF VETERAN PEER-TUTORING ON MATHEMATICS COURSE  
PERFORMANCE

by

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## **DEDICATION**

I dedicate this dissertation to my Personal Savior, the Lord Jesus Christ, and my Heavenly Father. To God be the Glory. I also dedicate this dissertation to my son, Angel Anthony Retta Cortez, to my parents, Mr. and Mrs. Santos and Guadalupe Cortez, to my Brothers and Sisters in Christ, and to my Brothers and Sisters at-Arms, and Family with the 2-502<sup>ND</sup> IN RGT, 101<sup>st</sup> Airborne Division (ASSLT). Lastly, and certainly not least, to my Fallen Brothers and Sisters, our Screaming Eagles who fell in foreign lands, fighting for our country in the wars in Iraq and Afghanistan. Till Valhalla:

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Description</b>
ANOVA	- Analysis of Variance
CRLA	- College Reading and Learning Association
GED	- General Education Development
IRB	- Institutional Review Board
MRP	- Million Records Project
STEM	- Science Technology Engineering and Mathematics
SVA	- Student Veteran Alliance
VA	- U.S. Department of Veteran Affairs
W	- Withdrawal

## **ABSTRACT**

Veteran peer-tutoring programs have been growing in number, but little research has addressed their effects on student veterans' success in postsecondary education. Schlossberg's (2012) adult transition theory has been applied to scholarly research on veteran postsecondary transition experiences using the fourth factor, strategies, focusing on student academic assistance such as tutoring. My study builds on Schlossberg's theory by examining a veteran peer-tutoring program. This study utilized a causal-comparative, between-subjects design to examine end-of-semester grades of a treatment (n=28) and comparison (n=28) group. Also, the relationship between frequency of tutoring visits and end-of-semester grades within the treatment group was examined. To obtain an adequate sample size, data across four semesters (spring 2017, fall 2017, spring 2018, and fall 2018) and mathematics courses (college algebra, precalculus, & calculus I) were aggregated for each group. A stratified randomized matching procedure was used to ensure the treatment and comparison groups had equal representation with regard to semester, course, and ethnicity. Mann-Whitney U test was the appropriate analysis approach due to low sample sizes and having an ordinal outcome variable (Field, 2013). Results found no statistically significant difference in grade distribution between groups. Spearman's rho was used to measure the frequency of tutoring visits and end-of-semester mathematics grades within the treatment group. The relationship between these two variables was not statistically significant. Greater usage of the intervention did not result in higher grades for those in the treatment group. Implications and recommendations for

developmental education and learning assistance researchers and practitioners are discussed.

## I. INTRODUCTION

Afghanistan and Iraq student veterans are not successfully completing college degrees or certificates in postsecondary institutions at rates compared to their more successful World War II, Korean War, and Vietnam Conflict student veteran predecessors (Cate, 2014; Student Veteran of America [SVA], n.d.). Afghanistan and Iraq student veteran graduation rates are lower at 51.7%, compared with the 56.1% graduation rate of traditional college students nationally, which contrasts with historical trends where student veterans maintained higher graduation rates over traditional students at 66% (Cate; SVA, n.d; Frederiksen & Schrader, 1952; Garmezy & Crose, 1948; Joanning, 1975). However, student veteran graduation rates are significantly above the national average compared with their non-traditional student peer's graduation rate (43.3%) enrolled in developmental education courses (Moore, 2004; Vacchi, 2011; Vacchi, 2013). Notwithstanding, the current low graduation rates of student veterans may stem from several factors in their transition to postsecondary institutions.

These factors possibly contributing to the lower graduation rate for Afghanistan and Iraq student veterans may include difficulty transitioning from the military into postsecondary institutions, undeveloped academic college skills, lack of peer academic support, and difficulties with rigorous college mathematics courses. DiRamio (2017) posits student veterans are candidates for possessing undeveloped academic skills due to extended time away from formal education with deployments in the military, and lack of peer academic support once the student veteran has begun transitioning into postsecondary institutions. Tennant (2014) pointed to mathematics courses as a particular area where adult students, such as student veterans, have less preparation than

traditional-age students, and whose graduation rates are lower than their traditional student counterparts. Mathematics courses play a critical role for most college students as they are required to take college algebra in their academic career. For students majoring in a STEM (Science, Technology, Engineering, and Mathematics) program, additional calculus courses are required to complete their degree. Pre-enlistment academic skills of student veterans, such as note-taking, study habits, and test preparation, are currently unknown and not addressed in current scholarly literature. Difficulties with rigorous college mathematics courses such as college algebra, precalculus, and calculus I, may contribute to current student veteran academic underperformance and lower graduation rates (Bonham & Boylan, 2012; Cate, 2014).

Learning assistance centers are designed to serve underprepared students and high achieving students experiencing difficulties navigating through rigorous college mathematics courses such as algebra, precalculus, and calculus I (Arendale, 2007; Stern, 2001). Fundamentally, developmental education programs and learning assistance centers share a common goal in maximizing learning potential for all developmental education students, drawing from theories on how students learn, and formulating practices based on these theories for implementation in assisting students holistically such as peer-tutoring (Casazza & Silverman, 1996; Smith, 2013). Peer-tutoring is a service commonly sought by students external to the classroom and provided by their campus' learning assistance center (Dodo-Balu, 2017). Veteran peer-tutoring offered at some learning assistance centers may provide the peer academic support necessary for student veterans to negotiate rigorous college mathematics courses, and in turn, raise the current graduation rates of student veterans (Dodo-Balu).

The problem my study aimed to address, by focusing on a student veteran peer-tutoring program, was the obstacle that college mathematics courses, as a degree requirement, may be for a majority of student veterans' attempting to complete their academic trajectory culminating in degree completion and graduation. Furthermore, student veteran attrition rates may be higher due to difficulties in passing mathematics courses without accessibility to veteran peer-tutoring programs. The impact of student veteran peer-tutoring on mathematics course performance has not been studied through current developmental education scholarship. Without this study being conducted in measuring the effectiveness of a veteran peer-tutoring program on student veteran mathematics grades, it is difficult to determine what factors contribute to the larger more serious issue of the student veteran population's current high attrition/low graduation rates. This study was designed to identify relationships between veteran peer-tutoring and algebra, precalculus, and calculus1 end-of-semester grades. To this end, two research questions guiding my study were as follows:

Research Question 1: Do student veterans who receive veteran peer-tutoring services significantly outperform student veterans not utilizing veteran peer-tutoring services when measured by mathematics grades for each of four semesters?

Research Question 2: For student veterans in the treatment group, is there a statistically significant relationship between the number of visits to the veteran peer-tutoring program and mathematics course grades?

In order to answer the first research question, my study utilized a causal-comparison, between-subject design to examine end-of-semester mathematics grades of student veterans in the veteran peer-tutoring program (Schenker & Rumrill, 2004). A

comparison group of student veterans not using tutoring was used in order to determine if there was a statistically significant difference in mathematics course grades between those who received tutoring and those who did not. Furthermore, my study examined the frequency with which student veterans utilized the veteran peer-tutoring program per semester to determine if there was a relationship between increased use of the tutoring program and higher end of semester mathematics grades within the group. To obtain an adequate sample size, data across four semesters (spring 2017, fall 2017, spring 2018, and fall 2018) and mathematics courses (college algebra, precalculus, and calculus 1) were aggregated for each group. A stratified randomized matching procedure was used to ensure the treatment and comparison groups had equal representation. A one-way analysis of variance (ANOVA) was used as a primary statistical analysis to match mathematics grades. Due to a violation of the assumption of homogeneity, a Mann-Whitney U test was run to match mean mathematics grades between groups. Spearman's rho correlation analysis was used for the second research question of this study, which examined the relationship between two variables, frequency-of-use of the veteran peer-tutoring program, and end-of-semester course grades.

### **Operational Terms and Definitions**

In order to avoid any vagueness or misunderstanding in the use of terms, for the purpose of this study, the following section defines some of the terms used in my study.

- Developmental Education is defined as a field of practice and research within higher education with a theoretical foundation in developmental psychology and learning theory, promoting the cognitive and affective growth of all postsecondary learners, and all levels of the learning continuum. Developmental

Education, in practice, is sensitive and responsive to individual differences and special needs among learners by commonly addressing academic preparedness, diagnostic assessment and placement, development of general and discipline-specific learning strategies, and affective barriers to learning (Arendale, 2005; Learning Support Centers in Higher Education [LSCHE], n.d.; Mulvey, 2008).

- Learning Assistance Center is defined as a place where students can be taught to become more efficient and effective learners. Learning Assistance Center services may include tutoring, mentoring, supplemental instruction, academic and skill-building labs, computer aided instruction, success seminars/programs, advising and more (Arendale, 2007; LSCHE, n.d.).
- Million Records Project (MRP) is a historic initiative providing near real-time data for policymakers, service providers, institutions of higher learning, and the general public working to support student veterans. It is a partnership between the Student Veteran Alliance, U.S. Department of Veteran Affairs, and the National Student Clearinghouse (MRP, n.d.).
- Nonveteran Students are students enrolled in postsecondary institutions who have never served in the United States Armed Forces.
- Nonveteran Tutors are tutors in postsecondary institution learning assistant centers who have never served in the United States Armed Forces and are enrolled as students.
- Non-traditional Students, using Horn and Berktold's (1998) definition, are students who are enrolled part-time, or less than 12 credit hours; have dependents such as children or grandparents; are employed full time, or more than 35 hours a

week; financially independent.

- Peer-Tutoring is defined as a service offered at learning assistance centers designed for tutoring rigorous courses such as science, math, or writing, in a face-to-face individual or group format (Agee, Hodges, & Castillo, 2018).
- Post 9/11 GI Bill is a federal program educational benefit providing veterans with 36 months of paid tuition, books, and basic housing allowance (U.S. Department of Veteran Affairs [VA], n.d.).
- Student Veterans are defined as veterans enrolled in postsecondary institutions who represent a diverse population across the country and are generally categorized with nontraditional students and non-prepared students.
- Student Veteran of America (SVA) is a coalition of student-veteran groups on college campuses across the globe. They are dedicated to assist veterans succeed in higher education by achieving their academic goals and gaining meaningful employment (SVA, n.d.).
- Traditional Students are defined as students between the ages of 18 to 24, who have obtained a high school diploma, and immediately continued their education at a postsecondary institution, without dependents of their own, and with minimal life experiences prior to enrollment (Butler & Markley, 2006; Macari, Maples, & D'Andrea, 2006).
- Underprepared Student are students who may be labeled “at risk” and are admitted to college or university with undeveloped or minimal skills needed to successfully complete a degree and requiring additional services (Maloney, 2003).
- Veteran Tutors are defined as student veterans employed in veteran peer-tutoring

programs designed to serve the student veteran population at a South-Central University.

### **Organization of Dissertation**

My dissertation follows a traditional five-chapter format. The first chapter of this dissertation introduces the study, and the second chapter focuses on the literature review, including the theoretical framework for this dissertation, and the gaps in research related to student veterans in postsecondary institutions. The third chapter describes the methods of the study, which include the research questions, the procedures, the participants, the measures, and the data collection methods. The fourth chapter provides the results of this study, and covers the primary and secondary analyses. The fifth chapter focuses on the discussion of the results, limitations of the study, future research recommendations, implications and conclusions.

### **Chapter Summary**

This chapter began with a brief discussion addressing the lower graduation rates of Afghanistan and Iraq student veterans in postsecondary institutions, compared to student veterans from World War II, the Korean, and Vietnam Wars. Also, a difference between student veteran and nontraditional student graduation rates as population segments served within developmental education was identified with student veteran current graduation rate at 51.7%, compared with nontraditional students' current graduation rate at 43.3%. Several factors possibly contributing to lower graduation rates include difficulty transitioning from the military to postsecondary institutions, undeveloped academic college skills, lack of peer academic support, and difficulties with rigorous college mathematics courses.

College algebra, precalculus, and calculus I were identified as rigorous mathematics courses possibly being problematic for student veterans as these courses have historically been challenging for college students. Peer-tutoring was introduced as a service sought by students external to the classroom and provided by their campus' learning assistance center. Further, veteran peer-tutoring was introduced as an academic support for student veterans enrolled in historically rigorous mathematics courses such as college algebra, precalculus, and calculus I with an additional potential benefit of facilitating their transition into postsecondary institutions. Also addressed in this chapter is the lack of developmental education scholarship focused on the impact of student veteran peer-tutoring on mathematics course performance. The purpose of my study to current developmental education scholarship on veteran peer-tutoring in addressing college mathematics courses as an obstacle to student veteran degree completion and graduation, was stated. Finally, a description of my study's research questions, a glossary containing key terms and definitions, and an overview of the organization of my dissertation study were described in this chapter.

The following chapter introduces peer-tutoring in assisting underprepared students enrolled in rigorous college mathematics courses. A description of student veteran historical enrollment and academic performance in postsecondary institutions follows. Schlossberg's (2012) adult transition theory as the theoretical framework of my study is discussed. The literature review for my study begins with historical and current scholarly literature on student veterans in postsecondary institutions, learning assistance centers, effectiveness of peer-tutoring, and historically rigorous mathematics courses (college algebra, precalculus, and calculus I). Finally, existing gaps in current student

veteran scholarly literature and research are addressed.

## II. REVIEW OF THE LITERATURE

Over the last 10 to 15 years, there has been an increase in research on the effectiveness of peer-tutoring in postsecondary institutions in the field of developmental education (Agee et al., 2018; Bonham & Boylan, 2012; Colver & Fry, 2016). Peer-tutoring has been a service offered at learning assistance centers for tutoring in courses such as science, math, or writing, in a face-to-face individual or group format (Agee et al.; Colver & Fry; Errazuriz, 2016). An expected outcome from the increase in research on peer-tutoring is helping underprepared students, for example student veterans, succeed in rigorous courses with traditionally high attrition rates such as college mathematics (Khaw & Raw, 2016; Mulvey, 2008; Xu, Hartman, Uribe, & Mencke, 2001).

Student veterans are students who served, or are serving in the military as active duty, national guard, or as a reservist. Historically, the characteristics of veterans who have served in every military conflict at home and abroad, such as resilience and commitment, have seen little change. In reviewing scholarly research literature pertaining to student veterans in postsecondary institutions, the same can be said as little has changed about the qualities and attributes student veterans have brought to their campus over the last seventy years (Ackerman, DiRamio, & Garza-Mitchell, 2009). Since the end of World War II, and continuing through the end of the Vietnam Conflict, student veterans enrolled in postsecondary institutions outperformed their traditional counterparts in grade point average earned and grades earned in what is identified today as STEM courses. The successful transition into postsecondary institutions resulting with the completion of a certificate or degree is evident with the achievements documented by World War II student veterans. That generation of student veterans alone produced

22,000 dentists, 67,000 doctors, 91,000 scientists, 238,000 teachers, 240,000 accountants, and 450,000 engineers, as well as three Supreme Court justices, three presidents, 12 senators, 14 Nobel Prize winners, and 24 Pulitzer Prize Winners (Cate, 2014; MRP, n.d.; SVA, n.d.; VA, n.d.). The Korean War and Vietnam Conflict generation of student veterans sustained the successful academic trend of their predecessors maintaining a 66% graduation rate even as learning assistance centers and tutoring programs were not readily available to them.

Afghanistan and Iraq student veterans have not performed similarly, despite increased veteran educational benefits and easier access to learning assistance centers and peer-tutoring programs at their postsecondary institution (Arendale, 2005; Cate, 2014). Some learning assistance center directors have established veteran peer-tutoring programs in an effort to assist student veteran academic transition and degree completion.

Adult transition theory posits various strategy factors (e.g., seeking new information on academic assistance at new student orientation) may contribute to successful holistic transition for student veterans into civilian life and postsecondary institutions (DiRamio, 2017; Schlossberg, 2012). Proactive usage of veteran peer-tutoring programs is an available strategy that might positively impact transition into postsecondary education; therefore, this variable (usage of veteran peer-tutoring) aligns with the strategy factor component of Schlossberg's adult transition theory. If veteran peer-tutoring programs were found to be successful in assisting student veterans to complete rigorous college mathematics courses such as college algebra, precalculus, and calculus I, such findings would help advance adult transition theory by providing empirical support for veteran peer-tutoring as an effective strategy factor. Currently,

little is known about the effects of veteran peer-tutoring programs. For example, in a 5-year study on first-year engineering students participating in peer-led mathematics study groups, Cancado, Reisel, and Walker (2018) found an increase in retention and graduation rates compared with first-year engineering students who did not utilize a similar peer-led mathematics study group. Although this study did not specifically address veterans, it provided general support for the idea that peer-tutoring may be a promising strategy for assisting student veterans.

In addition to the potential benefits of peer-tutoring on learning and achievement, veteran peer-tutoring may also reduce the feeling of isolation stemming from having a nonveteran peer-tutor with minimal commonalities and little to no connection in life experiences (DiRamio, Ackerman, & Mitchell, 2008). The mechanisms of veteran peer-support through a veteran peer-tutoring programs where commonalities and connections to life experiences are greater, may translate to higher academic performance in college algebra, precalculus, and calculus I, and a successful transition for the student veteran culminating in completion of a certificate or degree. These mechanisms of veteran peer-tutoring operate within the “strategy factor” of Schlossberg’s (2012) adult transition theory.

### **Theoretical Framework**

The focus of my study was on the effects of veteran peer-tutoring on students’ postsecondary mathematic achievement. Schlossberg’s (2012) theory provided a foundation for understanding how a peer-tutoring program may help veterans transition into and throughout their college journey. Therefore, I addressed each component of this theory because it was critical to understanding the transition process and how student

veterans cope with this process. However, the primary area investigated in my study pertained specifically to what Schlossberg referred to as the strategies factor. The strategies factor specifically addressed student choices to proactively address and cope with transition issues. Students' usage of veteran peer-tutoring can be viewed as a strategy that students use to cope with transition issues, both academically (because of the learning support involved) and socially (because of the peer-to-peer contact involved). To begin, I describe the major transitions according to Schlossberg's theory, followed by a description of four factors related to how student veterans may cope with these transitions. The strategies factor is one of these four factors discussed in more detail below. My primary objectives for reviewing this theory were (a) to provide a foundation for understanding the myriad factors affecting adult student transitions and (b) showing how my study specifically addressed the strategy factor within this theory.

### **Major Transitions**

Schlossberg's (2012) theory posits three major transitions which many adults experience that are applicable to student veteran transitions from military service into postsecondary institutions (Anderson, Goodman, & Schlossberg, 2012). According to Schlossberg's theory, major transitions include both obvious and subtle life changes, which only exist if it is the individual experiencing the transition (Goodman, Schlossberg & Anderson, 2006). Schlossberg's theory is relevant to traditionally aged college students as an adult development theory (Evans, Forney, Guido, Patton, & Renn, 2010). Major transitions for student veterans may include anticipated major life events, unanticipated major life events, and non-events as they assimilate into their new postsecondary institution environment.

**Anticipated major life events.** Anticipated transitions happen expectedly and include such events as graduating from high school, marriage, or the birth of a child. For student veterans, anticipated major life events may be combat deployment orders, the birth of a child during a combat deployment, end-of-term service of an enlistment contract, and admission into a postsecondary institution (Ackerman et al., 2009; Evans et al., 2010; Schlossberg, 2012).

**Unanticipated major life events.** Unanticipated transitions happen unexpectedly and are not scheduled. Events of this type include being fired, the sudden death of a family member, or getting a divorce. For student veterans, unanticipated major life events may be the death of a friend or comrade in combat, major illness, or injury. On a lesser scale of stress, but still unanticipated, might be difficulties learning and understanding college algebra, precalculus, or calculus I assignments resulting in the risk of failing the course (Ackerman et al., 2009; Evans et al., 2010; Schlossberg, 2012).

**Non-event transition.** Non-event transitions are ones an individual expected to occur but did not happen, like a marriage not taking place. For student veterans, non-event transitions may be major life events anticipated by the individual not materializing such as anticipating a scheduled re-deployment from a war zone or expecting an easy transition from the battlefield to the classroom (Ackerman et al., 2009; Evans et al., 2010; Schlossberg, 2012). From these three major transitions adults experience, Schlossberg posits four major sets of factors that strongly influence an adult's ability to cope with the three major transitions: situation, self, support, and strategies, which Schlossberg labeled as the four "S's."

## **Four Sets of Factors (4 S's)**

Schlossberg's (2012) application of the four "S's" in explaining how adults cope with major transition events has been applied to studies focused on current student veterans transitioning from the military to postsecondary institutions. Schlossberg posits the four "S's" influence an individual's ability to cope during their transition: situation, self, support, and strategies. As individuals encounter their transitions, the effectiveness of coping depends on the resources available to them in these areas (Goodman et al., 2006).

**Situation factor.** The situation factor is based on the person's situation and is dependent on the cause of the transition, the timing of the transition for the individual, the amount of control the individual possesses, the new role (s) now undertaken by the individual, how the individual assesses the transition, and any experience or familiarity the individual can apply to the transition (Schlossberg, 2012). The situation factor for student veterans takes place when they begin their postsecondary career. Student veterans must transition from a rigorous well-defined structure in the military where their role is outlined and expected results driven by directives from a chain of command, to an ambiguous setting where autonomy is freely exercised, military jargon is not universal, and new expectations are self-developed. The goal and accountability of completing a degree or certificate is dependent on the student veteran (Ackerman et al., 2009; Evans et al., 2010; Schlossberg, 2012).

**Self-factor.** The self-factor is strongly influenced by the individual's personal and demographic characteristics, and psychological resources (Schlossberg, 2012). Socioeconomic status, gender, ethnicity/culture, age, stage of life, and stage of health are

shaped by the individual's personal and demographic characteristics play an important role within the second "S," in how the individual views their place in life. The psychological resources possessed by the individual include resiliency, spirituality, personal values, outlook, and ego development (Schlossberg). For student veterans, the self-factor is strongly influenced from their time-in-service as a team member, where validation of self-worth and external mental, emotional, and physical support are provided. A student veteran's personal and demographic characteristics and psychological resources are more team focused, and team goal oriented. This may prompt student veterans to seek out other student veterans on campus for help with their transition in to postsecondary institutions and their academic trajectory (Ackerman et al., 2009; Evans et al., 2010; Schlossberg, 2012).

**Social support-factor.** The support received by the individual is in the form of affection, affirmation, aid, and honest feedback (Schlossberg, 2012). The social support-factor impacts the ability of an individual to adapt to a transition. The social support-factor is externally based as the individual receives support from family, friends, intimate relationships, and institutions or communities. For student veterans, on-campus veteran groups and veteran peer-tutoring may provide the external support functions provided through the social support-factor. Veteran peer-tutors, through honest feedback, affirmation, and aid in the form of academic tutoring, may positively affect a student veteran's transition, academic performance, and ultimately, increase their prospect for graduating (Ackerman et al., 2009; Elliott, Gonzalez, & Larsen, 2011; Evans et al. 2012; Schlossberg, 2012).

**Strategies factor.** The strategies factor pertains to the manner which the individual chooses to cope with their transition (Schlossberg, 2012). Individuals' coping responses are those modifying the situation, controlling the meaning of the problem, or aiding in managing stress stemming from their transition (Evans et al., 2010). Four coping modes for individuals choosing to reduce their stress and change their situation emanating from their transitions are: information seeking, direct action, inhibition of action, and intrapsychic behavior (Goodman et al., 2006; Schlossberg, 2012). For student veterans struggling with transitioning into their new roles in postsecondary institutions, the strategies factor may lead them to seek academic help in rigorous mathematics courses from veteran peer-tutors as well as a sense of belonging through shared camaraderie. Use of the strategies factor through veteran peer-tutoring has not been studied and may provide a scholarly lens into benefits of veteran peer-tutoring programs in learning assistance centers.

The focus of this study was the fourth strategy factor of Schlossberg's (2012) theory. I have used this factor to quantify and analyze data on veteran peer-tutoring interactions in the form of end-of-semester mathematics grades earned as well as the number of tutoring sessions attended.

### **Current Application of Schlossberg's Adult Transition Theory**

Current scholarship foci on student veterans in postsecondary institutions have predominantly utilized Schlossberg's first three factors of her transition theory, such as the social support-factor. For example, Ryan, Carlstrom, Hughey, and Harris (2011) focused on the social support-factor when conducting their study on postsecondary academic advisors' experience, attitudes, and understanding of student veteran needs in

order to assist student veterans successfully integrate into their new surroundings. Their study produced findings identifying gaps by academic advisors with understanding the differing needs between student veterans and the general student population. Similar gaps in understanding student veteran needs may exist with learning assistance center directors and tutors serving student veterans. The findings utilizing the social support-factors produced from the Ryan et al. study supports my strategy-factor based study by allowing me to postulate veteran peer-tutoring may provide academic assistance for student veterans seeking peers to share their experiences, understand their needs, and hold positive attitudes in assisting student veterans through holistic means. Although these findings from Ryan et al. study did not directly support my study, the findings from their study on the social support-factors are important to consider.

Schlossberg's (2012) situation and self-factors have been used by scholars in studying student veteran individual transitional experiences. DiRamio et al. (2008) applied Schlossberg's theory as a guiding theory focused on the situation and self-factors in a multi-campus study where 25 student veterans were interviewed on their individual experiences transitioning into postsecondary institutions. DiRamio et al. posited student veteran academic success in transition and academic performance may reside with veteran peer-support groups. The implications of this study supported my study suggesting veteran peer-tutoring may positively and significantly affect end-of-semester grades for student veterans seeking a veteran peer-tutor format. The findings from this study allowed researchers to build new scholarship pertaining to student veteran transition experiences, and the importance of faculty and staff understanding the need for social support of student veterans based on student veteran shared experiences.

Elliott et al. (2011) built on the findings of Ackerman et al. (2009) in a study utilizing Schlossberg's self and social support-factors. The Elliott et al. study focused on student veteran transition experiences into postsecondary institutions with consideration of combat experience, posttraumatic stress disorder, alienation experiences, and faculty attitudes towards student veterans, as variables of interest. The results of this study indicated faculty members with more military contact outside of higher academia, such as interactions with family serving or having served in the military, more readily addressed issues related to the student veterans enrolled in their class. In addition, the results of the study further indicated faculty who thought highly of student veterans were more likely to provide additional academic assistance to student veterans. Elliott et al. found assistance provided by the faculty not only benefited the student veteran academically, it also provided an additional social support system for the student veteran.

Along with the benefits of faculty assistance for student veterans, Elliott et al. (2011) found student veteran transition experiences were positive when they possessed a strong belief in their ability to negotiate through their transition, and they experienced familial support through their transitions. Ackerman et al. (2009), and Elliott et al. (2011) findings using Schlossberg's situation, self, and social support-factors were indispensable to my study on veteran peer-tutoring, as evidence from their studies suggest student veterans seek social and academic support from their peers in order to successfully attain high grades in rigorous courses and graduate with a degree or certificate.

Schlossberg's (2012) strategies factor has been used to study student veteran transitional preferences in their postsecondary experiences. For example, Ruman and

Hamrick (2010) applied Schlossberg's fourth "s" (strategies) to identify transition strategies student veterans may seek, such as the academic assistance of other veterans in similar phases of transition and student veteran attempts to form student veteran groups in order to share experiences with fellow student veterans. Ruman and Hamrick found student veterans preferred the group format when facing postsecondary challenges over individual approaches for negotiating the rigors of higher education transitions. Student veteran preference for a group format setting was confirmed in Moore's (2013) study which found this preference stemmed from the similarities of military group format structures used by student veterans throughout their time in service. These findings lend credence to the belief a group format approach is preferred by student veterans may indicate their willingness to seek and use veteran peer-tutoring services to assist in negotiating the rigors of college mathematics courses.

My study will add to current scholarship by focusing on the effectiveness of veteran peer-tutoring for student veterans seeking academic tutoring assistance in order to successfully pass college mathematics courses utilizing Schlossberg's fourth factor (strategies). The application of the strategies factor with my study gave insight to the benefits of veteran peer-tutoring for student veterans who preferred to work in a peer or group academic support environment (Agee et al., 2018).

Student veterans preferring to seek academic assistance through a veteran peer-support structure compatible with a military format of training and learning may likely utilize veteran peer-tutoring in order to negotiate rigorous mathematics courses with high attrition and failure rates. Utilizing a peer-tutoring strategy, or group peer-tutoring, in college mathematics courses may provide an effective approach in lowering attrition rates

for student veterans, who understand their academic skills may be underdeveloped or have diminished due to their time in service (Ackerman et al., 2009). Although Schlossberg's transition theory has been used in qualitative research to examine individual student veteran experiences as discussed above, the results of these studies have produced an overarching theme gleaned from student veteran interviews (Anderson et al., 2012). The emerging theme from these studies indicates an overwhelming desire of most student veterans interviewed to participate and associate with groups consisting of their veteran peers. My study addressed one-on-one peer tutoring and group peer-tutoring approaches used in findings of qualitative studies grounded on Schlossberg's theory, in order to examine differences in mathematics grades produced by student veterans using veteran peer-tutoring assistance compared with mathematics grades student veterans who have chosen to not use any tutoring assistance at the university. To understand why student veterans may need assistance transitioning into postsecondary institutions, and to further understand why veteran peer-tutoring may benefit student veterans' academic and holistic needs, we must understand the student veteran. The following section will begin with a brief description of the student veteran population and continue with a review of scholarly literature and studies conducted on student veteran historical and current academic performance to date.

### **Student Veterans**

It is important to describe the student veteran population in order to understand what factors may contribute to successful academic outcomes, and the academic obstacles preventing student veteran academic success in courses such as college mathematics with this study. Furthermore, a more in-depth understanding of the student

veteran population is important for preparing academic learning assistance centers and tutoring programs to better serve an increasingly growing postsecondary student veteran population. This will enable learning assistance centers and tutoring programs to best pair student veterans with academic tutors who can model tutoring and teaching strategies conducive to student veteran learning through a veteran peer-tutoring program. The growing number of student veterans across the country in postsecondary institutions is demonstrative of the growing veteran population in the United States as the wars in Afghanistan and Iraq continue.

The U.S. Bureau of Labor Statistics (2019) estimated the total current veteran population to be approximately 18.9 million, with 3.9 million Afghanistan and Iraq veterans as a part of the total number in its latest report. Approximately 82% of the military force is composed of men, with the majority being white with a mean age of 25 (Moore, 2013). Women veterans comprise 18% of the total number of Afghanistan and Iraq veterans that served, which is a significant increase from the estimated 4%, or 11,000 total women in military service from the combined World War II, the Korean War, and the Vietnam eras (Moore; Rolen, 2017). Prior to the use of non-traditional status affixed to individuals who did not enroll into a postsecondary institution immediately after high school, student veterans after World War II became the first large student population segment to contrast with the traditional perception of a college student.

As a large student population, student veterans are typically identified as nontraditional students as they share some of the criteria listed under the definition of a nontraditional student (Horn & Berktold, 1998). Today's student veterans are prime

candidates to benefit from enrollment into developmental education courses and utilize peer-tutoring, due to their prolonged deployments and specific military occupational training making it difficult for them to engage in courses historically rigorous such as college mathematic courses (Bonham & Boylan, 2012). Most student veterans on average serve a minimum of two- to three-and-half year enlistment in military service (V.A., n.d.). Historically, student veterans have commanded their academic trajectory by having decided which career to pursue prior to enrollment in a postsecondary institution (Cate, 2014; Gowan, 1949).

Gowan's (1949) study, where 146 student veterans were interviewed on their career path, found veterans were decided on their choice of degree and the career they would begin upon completion of their degree. Furthermore, Gowan found student veterans invested more time on average a week (10 hours) studying compared to nonveteran students. Kim and Cole (2013) found today's student veterans display the same characteristics and initiative-taking mindset as the student veterans from Gowan's study. Today's student veterans tend to be less critical of their instructors compared to their nonveteran peers and are more willing to open dialogue with their instructors over grades and assignments. Evidence of self-investment made by student veterans in their academic success with obtaining a degree or certificate has been observed in studies conducted between World War II and the Vietnam Conflict (Fredericksen & Croce, 1950; Joanning, 1975). Due to current student veteran high attrition rates, a focus of study on student veterans has shifted away from student veteran self-investment to student veteran resilience in an attempt to identify causal factors (Cate, 2014).

Markel, Trujillo, Callahan, and Marks (2010) measured student veteran resilience,

with two separate cohorts of student veterans, one in the spring of 2009, and the other in the fall of 2009. They found high levels of resilience were present over a two-semester period in navigating through college course work for the first time. Specifically, when student veterans understood the curriculum of their courses as explained by their instructors, the result was an increase in retention rates (92%) of both cohorts with pre-instruction resiliency grades compared to their baseline retention rate at the beginning of the study. In short, when course outcomes and objectives were explained to student veterans where they understood what was expected of them, a decrease in attrition (dropped/failed classes) was observed, and higher student veteran resiliency rates were observed. In addition to understanding the curriculum once explained by their instructors, studies have found student veteran preference for strong classroom structure and academic assistance. These findings may support my study on veteran peer-tutoring as it may provide a similar strong academic structure capitalizing on the potential of student veterans' ability to understand strategies through tutoring assistance of college algebra, precalculus, and calculus I for student veterans seeking assistance.

Moore (2013) found student veterans flourished with classrooms demonstrating rigidity in their structure, such as detailing explicit instructions on assignments and guidelines expected of them by their instructors. In addition, he found student veterans approached coursework assessments and assignments with a solution-focused mindset instead of a problem-oriented approach, preferring to use a group effort versus an individual effort in solving problems. Moore's findings further strengthened the argument student veterans would greatly benefit from student veteran peer-tutoring programs sharing some of the rigid structure familiar to them, which was beyond the

scope of my initial study.

Student veteran academic progress has been documented since veterans began accessing postsecondary institutions after World War II with their educational benefits available through different variations of the GI Bill, with the goal of helping student veterans achieve academic success (Garmezy & Crose, 1948; Moore, 2013; Olson, 1973; Veteran Affairs [VA], n.d.). Similar veteran educational benefits today also allow student veterans access to learning assistance center-based veteran peer-tutoring services. Access to veteran peer-tutoring through their GI Bill education benefits allows for more exclusive veteran peer-tutoring assistance not available to their nonveteran student counterparts. This study helped strengthen the position of my study in addressing the importance of student veteran access to peer-tutoring provided through their educational military benefits.

Frederiksen and Schrader's (1952) research focused on student veterans in postsecondary institutions with comparisons of academic progress and classroom successes between student veterans and nonveteran students after World War II. Frederiksen and Schrader sought to build on Garmezy and Crose (1948) study by addressing concerns of low academic performance by student veterans returning from World War II. Frederiksen and Schrader study used a sample size of approximately 10,000 student veterans across 16 college campuses. Results from this study indicated student veterans earned higher grades compared to their nonveteran peers across all course subjects to include traditionally difficult mathematics courses. The goal of helping student veterans successfully negotiate through their transition into postsecondary institutions, and successfully complete a degree or certificate has been the

focus of current research. These findings helped guide my study in determining if veteran peer-tutoring as a treatment to their academic success in rigorous college mathematics courses.

Recent scholarly research has focused on student veterans' transitional experiences into postsecondary institutions from active duty status (Ackerman et al., 2009). Most prevalent from this current research focus on student veterans in higher education have been studies based on qualitative methodological approaches such as the DiRamio et al. (2008) study identifying emerging student veteran transition themes derived from personal interviews. The implications from these studies indicated a strong shift in focus from student veteran academic performance to student veteran transition experiences. Yet, not all of current student veteran scholarship is academic performance-based.

### **Student Veteran Non-Academic Transitional Experience Scholarship**

Other scholarly research on student veteran transitional experiences do not focus specifically on academic performance outcomes, and contribute to the current scholarship gap, include research on female and minority student veterans. For example, Doan and Portillo (2016) posited women in the military experience fluidity in their identity as their workplace environment changes, in contrast to men in the military who demonstrate a rigidity in identity not influenced by changes in role or workplace environment. Mankowski, Towers, Brandt, and Mattocks (2015) conducted a qualitative sub-study interviewing eighteen female veterans from Indiana and New England who had served in Afghanistan and Iraq. The researchers through their study sought to identify reasons why women joined the military. The results of the study identified themes where female

veteran reasons for joining the military included job trainings, education opportunities, and employment opportunities after their enlistment contracts with the military had concluded.

Pawelczyk (2017) conducted a qualitative study based on interviews of women soldiers on active duty at the time they were asked to participate. The focus of the study was in capturing themes from shared women's experiences and their views on their roles in a male-dominated institution such as the military. The findings of this study underscored the predominant view where women felt their roles in decision making and contribution were limited and seen as sub-level compared to their male counterparts.

Lutz (2008) conducted a study on minorities in the military to see if the reason for their enlistment was financially based, and to see if their minority status influenced their experience in a white dominated institution. Lutz found Latinos who identified as "other" were more accepting of conforming to military cultural norms. Lutz further found Latinos who specifically identified as Mexican tended to place their military identity before their ethnic racial identity. Also, Lutz's study found other Latino groups such as Puerto Ricans, were more acceptable of placing their military identity before their cultural identity. As important as these areas of student veteran research are, they are beyond the scope of this study, and currently contribute to the scholarship gap identified through this review of literature.

Albeit, some learning assistance centers across the country have established veteran peer-tutoring programs based on current student veteran transition qualitative research. The role learning assistance centers take in the development of veteran peer-tutoring is critical in providing student veterans with the opportunity to receive needed

academic and holistic support. The following section reviews literature on learning assistance centers in postsecondary institutions, and their role in assisting student veterans with traditionally rigorous college courses such as mathematics.

### **Learning Assistance Centers**

With an extended delay in enrollment into a postsecondary institution due to enlistment obligations to the United States military, the student veteran may not have the necessary academic study skills or problems solving skills to negotiate through the rigors of higher education curriculum such as college mathematics (Ackerman et al., 2009). This may prompt student veterans to seek help through learning assistance centers and tutoring services on their campuses. Learning assistance centers often provide academic services utilizing individual and group approach formats such as supplemental instruction and peer-tutoring to teach the mathematics skills necessary for independent problem solving (Agee et al., 2018).

Learning assistance centers have historically provided college students with the additional external classroom support to help underprepared students succeed through course completion and increased retention in conjunction with remedial or developmental education courses since the 1970's (Arendale, 2004; Wurtz, 2015). Perin (2004) posited that without learning assistance centers providing underperforming students in postsecondary institutions with the necessary academic support conducive to student success, at-risk students are more likely to fail their courses and not finish their education. Agee et al. (2018) addressed the various organizational structures providing reading and learning strategies through the extensive use of peer-tutoring, mentoring, peer cooperative learning programs, and academic course pairing in learning assistance

centers.

For student veterans seeking external classroom assistance, the availability of peer-tutoring through several delivery formats, and the accessibility of these services favorable to their class schedules, may prompt student veterans to seek academic assistance through these avenues (Driouech, Sisto, Lorusso, & Raeli, 2015; Moore, 2013). These avenues may stem from observed outcomes in studies focused on various tutoring approaches available at learning assistance centers, which posit student's increased confidence in their ability to obtain passing grades in traditionally difficult courses such as college mathematics (Cancado et al., 2018). For student veterans seeking academic assistance at their postsecondary institutions learning assistance centers, veteran peer-tutoring may provide student veterans with the confidence in believing they may be helped due to seeing veteran peer tutors having successfully negotiated the same obstacles they now face (AbdulRaheem, Yusuf, & Odutayo, 2017).

One of the most requested services by underprepared students struggling with courses having high attrition rates has been peer-tutoring offered at learning assistance centers at their respective campuses (Colver & Fry, 2016). For many students, peer-tutoring is provided at no additional charge as these services are paid through student registration fees (Agee et al., 2018). This allows for student veterans using the veteran peer-tutoring services in my study to seek academic assistance without the obstacle of having to pay for the service.

The following section addresses current research studies on peer-tutoring, presenting evidence guiding my study on veteran peer-tutoring effectiveness for student veterans undertaking rigorous college courses.

## **Peer-Tutoring**

Although interest in research focused on peer-tutoring has increased in recent years, peer-tutoring is not a recent phenomenon in academic tutoring. Peer-tutoring is believed to have been practiced as far back as ancient Greece as a linear model of transmission of knowledge between a student with a stronger command of a subject teaching their underprepared peer(s) (Topping, 1996). Today, peer-tutoring is conducted through informal means such as classmates studying together with one peer possessing a stronger command of rigorous course content assisting their underprepared peer (Topping; Topping et al., 1997). Peer-tutoring is also provided through formal means as a student service available individually or in group format at learning assistance centers (Banbel & Chen, 2014; Colver & Fry, 2016). Agee et al. (2018) posit academic peer-tutoring strategies maybe an effective solution in addressing low academic performance in courses such as college mathematics by underprepared students, such as student veterans. Agee et al. stated that peer tutoring offered through learning assistance centers may be beneficial as the subject focus for peer tutoring is college mathematics, college science, or writing conducted in personal one-on-one tutor settings. Evidence produced from current research studies on peer-tutoring indicates that peer-tutoring helps the tutee gain confidence in engaging difficult course subjects when emotional support and affirmation are provided by the tutor (Clarence, 2018; Dodo-Balu, 2017; Drago, Rheinheimer, & Detweiler, 2018). Dodo-Balu's study produced results indicating through participant feedback that students who felt despair and contemplated the decision to withdraw from a difficult course and their overall studies were encouraged to continue forward in adapting effective strategies through peer-modeling resulting in academic

success.

Errazuriz (2016), utilizing a quasi-experimental design with a threefold model of peer-tutoring at a writing center, found peer-modeling was an effective strategy improving the tutee's writing quality and performance throughout the semester.

DeJarnette, Hord, and Marita (2016) conducted a peer-tutoring study, utilized functional linguistics in order to observe how peer-tutors and tutees construed meaning relating to algebraic linear function in tutoring sessions held throughout a semester. Findings from DeJarnette et al. study supported peer-tutoring as an effective way to provide the tutor and tutee through application of various mathematical linear functions using shared meaning and understanding. The importance of these findings in support of my study may be student veteran tutors sharing common functional linguistics such as military jargon, and common military experiences, may assist the student veteran tutee in learning and applying newly constructed independent study skills as a result of these veteran peer-tutoring interactions. These findings may contribute to the belief amongst learning assistance center directors that an investment in veteran peer-tutoring is needed to assist students academically through veteran peer interaction.

Many learning assistance center directors believe peer-tutoring is their most effective service in helping underprepared and prepared students successfully learn new material and successfully complete rigorous courses such as mathematics courses (Fullmer, 2012; Hernandez-Vargas, Martinez-Espinosa, & Carranza Nunez, 2013; Nestel & Kidd, 2003; Truschel & Reedy, 2015). Recent studies on the impact of peer tutoring may support the position of learning assistance directors in establishing veteran peer-tutoring programs. Findings from these studies show a statistically significant difference

between students using peer tutoring with end of semester math and science grades, compared with students who did not use peer-tutoring within the same semesters (AbdulRaheem et al., 2017; Marx, Wolf, & Howard, 2016). The goal of learning assistance center directors over the last three decades has been to enhance the learning experience for the tutee through tutor professional development focused on teaching skills that align the tutor with the tutee at the tutee's course entry level for understanding the content being tutored in (Arco-Tirado, Fernandez-Martin, & Fernandez-Balboa, 2011; Perin, 2004; Truvert, 2014).

Student veterans may benefit from peer-tutoring where the tutor is also a student veteran possessing the skills to help the tutee learn at their course entry level of understanding. With an increase of veteran enrollment into postsecondary institutions in recent years, some administrators in learning assistance centers have been keen to establish student veteran peer-tutoring programs through a partnership with their local university veteran affairs office (Cate, 2014; MRP, n.d.; SVA, n.d.). An important factor determining the effectiveness of peer-tutoring may extend to veteran peer-tutoring programs is the influence on student veteran self-reliance and their academic performance.

Marx et al. (2016) conducted a study exploring peer-tutoring relationships and how they influenced students' self-reliance and their academic performance. Marx et al. examined 333 tutor and tutee pairs at a learning assistance center in the spring of 2015. Findings from their study showed that an increase in frequency of tutoring sessions with their peers, and the quality of the interactions between the tutor and the tutee, were probably associated with an increase of independent study habits for the tutee, and higher

college algebra academic outcomes for the treatment group as measured by end-of-semester grades. This study supports a hypothesis in my study where a higher frequency or occurrences of tutoring interactions within the student-veteran treatment group may result in higher end-of-semester mathematics grades for those using peer-tutoring, in comparison with participants not accessing peer-tutoring services. Additional studies conducted on peer-tutoring have found evidence of positive effects on student mathematics performance.

Xu et al. (2001) conducted a study examining the effects of peer-tutoring on students' mathematics performance in a college algebra course. The study was composed of two groups of students in college algebra courses where a treatment group consisted of students using tutoring services, and a comparison group consisted of student not using the tutoring service. The results of the study found no statistically significant difference between the group's final exam grades, however, there was a statistically significant difference within the treatment group as at-risk low performing student's grades were higher when they used the tutoring services with higher frequency. Xu et al.'s study paralleled my study, as they examined the effects of peer-tutoring in mathematics content with nonveteran students. My study examining veteran peer-tutoring influence on student veteran mathematics course grades may yield similar findings of statistically significant differences in course performance. Studies on peer-tutoring have produced similar statistically significant differences with student grades for courses other than mathematics, such as chemistry.

Parkison (2009) conducted a study on peer-tutoring in calculus and chemistry and found a statistically significantly lower attrition rate and significantly higher exam grades

with students using peer-tutoring compared to students who did not. In addition, Parkison found higher exam grades with students using the tutoring service more frequently within the treatment group. Parkison used first and second year students for the study in order to evenly match both groups using an analysis of variance. The student's intake survey and mathematics diagnostic tests were the basis for matching the two groups. Parkison used participants meeting similar inclusion criteria as identified in my study, while measuring for relationships within subject's science grades based on frequency-of-tutoring use, and criteria identifying first and second year student veterans. This review of scholarly literature on peer-tutoring has suggested higher frequency of peer-tutoring sessions may result in higher letter grade attainment for students with learning disabilities or diminished study skills.

Michael's (2016) review of literature strengthened my study as he surmised peer-tutoring for students with learning disabilities or diminished study skills stemming from an absence of rigorous coursework such as college mathematics, may influence higher grade averages and grades earned. Michael found the more sessions a tutee completed with a tutor, the higher probability a tutee would achieve successful learning outcomes such as higher letter grade attained. This may draw student veterans to seek veteran peer-tutoring as an initial preference, and as a valuable additional resource in order to gain mastery over difficult course subjects such as college mathematics (Petrillo, 2016; Tien, Roth, & Kampmeier, 2002). Some hesitation for student veterans participating in peer-tutoring programs may be the assignment to a nonveteran peer-tutor, or a nonveteran female peer-tutor, as studies have shown the general male student college population tend to not participate in or seek peer-tutoring assistance for college mathematics from non-

male peers (Wright, 2003).

The following section will be a review of literature on traditionally difficult mathematics courses, such as college algebra and calculus I, with historically high attrition rates for nontraditional and underprepared students such as student veterans. In addition, this review of literature on college algebra, precalculus, and calculus I will conclude with the importance of veteran peer-tutoring in assisting underprepared students such as student veterans successfully complete these rigorous courses.

### **College Algebra, Precalculus, and Calculus I**

College mathematics has historically been a rigorous college course that results in higher attrition rates in first generation, nontraditional, underprepared, and developmental students than perhaps any other subject taken by first generation students as are found within the student veteran population (Bonham & Boylan, 2012). Underprepared students are often labeled as at-risk and are portrayed as unwilling or unable to manage rigorous academic tasks (Maloney, 2003). Research has shown anxiety and stress are related to postsecondary developmental students' achievement, gender, and age (Woodard, 2004). Anxiety and stress in developmental students may also develop due to the time gap existing between developmental students graduating high school or obtaining the equivalent certificate in a General Education Development (GED) may make courses such as college algebra difficult to complete (Elliott, 2011). Historically, student veterans successfully completed rigorous college mathematics courses despite the time gap (in years) serving overseas (Garmezy & Crose, 1948). For current student veterans, the time away from formal education due to multiple deployments may create an additional barrier hampering the academic success trend in college mathematics (Cate,

2014). Veteran peer-tutoring may help current underprepared student veterans raise their completion rates in college mathematics courses such as college algebra with which nontraditional students struggle.

Nontraditional students struggle with college algebra at higher rates compared to traditional students (Johnson, 2017). Faulkner, Fitzmaurice, and Hannigan's (2016) comparison study of mathematical performance between nontraditional students and traditional students over a ten-year period found a statistically significant difference in grades from diagnostic tests. Nontraditional students had a lower mathematics grade mean than traditional students during this time. In addition, they observed a yearly increase of nontraditional students with no increase in diagnostic grades observed with this group. The findings from Faulkner et al. study strongly indicated the trend for underprepared and nontraditional students enrolled in calculus I may be similar.

Calculus has also contributed to the high attrition rates of students in postsecondary institutions for years. Patrillo (2016) pointed to a 28-yearlong study by Purdue University which found 43% of engineering students left engineering due to their struggles with calculus. Worthley, Gloeckner, and Kennedy (2016) conducted a study on freshmen STEM students consisting of non-declared majors, nontraditional students, and students choosing an early morning section class. Nontraditional students' exam grades were lower as this group yielded higher failing grades. Furthermore, a link between minority nontraditional students failing calculus and any other subject taken during the semester by the student was found (Worthley et al.). Treisman (1992) found minority students, predominantly African-American and Hispanic students, were not prepared to successfully complete the mathematics prerequisites of calculus, leading to higher

attrition rates and lower exam grades. The student veteran population is comprised of minority groups reflecting the national veteran population in terms of numbers. Minority student veterans who are more at-risk in failing college mathematics courses, such as precalculus and calculus I, may benefit more from veteran peer-tutoring. The assistance provided for student veterans through veteran peer-tutoring may be needed due to student veterans' extended time away from postsecondary institutions, and possible underdeveloped mathematics skills needed for college mathematics.

### **Gaps in Student Veteran Literature**

This section will address current literature gaps in the scholarly field focused on student veterans in postsecondary institutions, learning assistance, and mathematics scholarly literature. The gaps in the methodology of current research studies will be addressed, as well as the limitations resulting from these gaps will be explored.

Current research studies on student veterans in postsecondary institutions (Ackerman, et al., 2009; DiRamio, 2017) do not address the lower academic rates found through data collected by independent organizations such as the Student Veteran Alliance (Cate, 2014). Without a causal-comparison, between-subject study conducted on student veteran academic performance in postsecondary institutions, it is unknown if the current academic performance rate of student veterans can be attributed to ineffective nonveteran peer-tutoring support most commonly available to student veterans. Furthermore, a scarcity in causal-comparison, between-subject studies conducted on student veterans' academic performance may prove difficult when identifying performance gaps. Also, current studies on student veterans have primarily been conducted at community colleges, and not four-year universities. My study may help close the current scholarly gap by

examining mathematics grades with this generation of student veterans, at a large South-Central University.

Current literature on student veteran academic progress and performance for Afghanistan and Iraq student veterans' large-scale research studies are limited to independent organizations such as the Student Veterans of America with minimal access to government statistics reported by postsecondary institutions (Cate, 2014; MRP, n.d.; SVA, n.d.). To date, the Student Veterans of America have conducted a study measuring academic success of student veterans in higher education through data collected resulting from collaborations with postsecondary institutions and federal agencies. Findings from data collected on academic progress and performance for student veterans today are provided through government agencies such as the Veterans Administration and the National Center of Education Statistics. The Student Veteran of America collected and analyzed data retrieved from veteran administration databases and participating postsecondary institutions across the country yielded findings demonstrating student veterans today are not as successful in their academic outcomes as their predecessors in completing certificates and degree attainment.

Cate (2014) found student veterans experienced higher attrition rates compared to their traditional student peers and graduated at lower rates compared with past student veterans. The findings from the Student Veterans of America's MRP were limited as they did not address course completion by student veterans, grade point averages, or the impact of academic assistance such as peer-tutoring and learning assistance centers on student veteran outcomes. Furthermore, scholarly research, such as Ackerman, et al. (2009), DiRamio et al. (2008), and DiRamio (2017), conducted on student veterans in

postsecondary institutions, and independent of the SVA, have instead focused on transitional experiences and institutional support external to classroom and learning assistance center settings. This discrepancy in the research has created a shift from student veteran academic performance of current student veterans to their transition experiences making it difficult to determine the cause of student veteran academic underperformance and high graduation attrition rates. The implications of this current gap have led to my study focusing on the impact of student veteran peer-tutoring on end-of-semester mathematics scores for student veterans to begin closing this gap.

Schlossberg's (2012) theory has been primarily applied to qualitative studies on student veteran transitions focused on shared experiences of student veterans, faculty and student veteran relationships, as well as academic advisors and student veteran interactions, and academic resources related to helping ease student veteran transitions (Ackerman et al., 2009; DiRamio et al., 2008; Elliot et al., 2011; Ryan et al., 2011; Wurster, Rinaldi, Woods, & Liu, 2013). Schlossberg's (2012) first three factors, situation, self, and support, have been the focus of current research pertaining to student veterans. For example, Brenner et al. (2008) focused their study on student veterans in postsecondary institutions with mental and physical limitations, where the support-factor of the student veteran was studied to determine their ability to adapt to transitioning to a postsecondary institution. Brenner et al. designed their study to address the needs for additional veteran friendly mental and physical health services in coordination with the U.S. Department of Veteran Affairs located on campuses. Much attention has been given to this specific scholarship focus due to an increase of student veterans with physically unobservable mental injuries sustained from their time in service, who suffer from post-

traumatic stress disorders and traumatic brain injuries (VA., n.d.). Due to the increase of this segment of student veteran population suffering from posttraumatic stress disorders and traumatic brain injuries, it is very important for researchers to continue studying this population group to better serve student veterans in their transition from military service to postsecondary academic careers. As important as the need to continue this area of research is, it is beyond the scope of this study, and contributes to the current scholarship gap of student veteran academic performance literature.

The scholarship gap identified with current research on student veterans' academic performance lies with the fourth factor (strategies). Current research studies on student veterans have not focused on the impact of academic support available to student veterans in classrooms and learning assistance centers via tutoring, peer-tutoring, and veteran peer-tutoring. These mechanisms currently in place and accessed by student veterans in learning assistance centers, were measured through a causal-comparison, between-subject study approach utilizing Schlossberg's (2012) strategies' factor to address if veteran peer-tutoring was helpful to student veterans.

### **Chapter Summary**

This chapter briefly introduced research on the effectiveness of peer-tutoring and defined peer-tutoring as a service provided through learning assistance centers. In addition, student veterans were described as a student population in postsecondary institutions. Schlossberg's (2012) theory of adult transition was presented as the theoretical framework for my study on veteran peer-tutoring. My focus on utilization of Schlossberg's fourth factor, strategies, in my study was addressed.

A review of student veteran literature utilizing Schlossberg's (2012) theory

followed. Also, a review of literature on transitional experiences for student veterans was explored. A focus on the organizational structure of learning assistance centers in providing underprepared and nontraditional students with peer-tutoring services was described. A review of literature on college algebra, precalculus, and calculus I as historically rigorous courses was addressed. Finally, gaps in student veteran literature were discussed. The next chapter will detail the methods of this study.

### **III. METHODS**

The primary focus of my study was to investigate if veteran peer-tutoring had an impact on mathematics course performance for student veterans at a large university in South-Central U.S.A. To address this focus, I compared a treatment group of veterans who voluntarily participated in veteran peer-tutoring to a comparison group of veterans who did not use the peer-tutoring service. A secondary focus of my study was to examine the relationship between the frequency of tutoring visits and end-of-semester mathematics course grades. The courses targeted for my study were college algebra, precalculus, and calculus 1, as these courses have historically resulted in higher attrition rates amongst nontraditional students; and have been the focus of academic performance with student veterans (Bonham & Boylan, 2012; Garmezy & Crose, 1948). This chapter details the procedures used for data collection and participant matching, the variables of interest measured, and the research design of this study.

#### **Research Questions**

The aim of this study was to address the scholarship gap identified in the review of literature on student veterans in postsecondary institutions, specifically, on the absence of scholarship pertaining to the impact of veteran peer-tutoring on student veteran mathematics academic performance. Toward this end, the research questions and hypotheses for my study were as follows:

Research Question 1: Do student veterans who receive veteran peer-tutoring services significantly outperform student veterans not utilizing veteran peer-tutoring services when measured by mathematics grades for each of four semesters?

H<sub>1</sub>= Student veterans receiving veteran peer-tutoring services will significantly

outperform student veterans not using the veteran peer-tutoring service.

Ho= Student veterans receiving veteran peer-tutoring will not significantly outperform student veterans not using the veteran peer-tutoring service.

Research Question 2: For student veterans in the treatment group, is there a statistically significant relationship between the number of visits to the veteran peer-tutoring program and mathematics course grades?

H<sub>1</sub>= There is a statistically significant relationship between the number of visits to the veteran peer-tutoring program and mathematics course grades for student veterans in the treatment group.

Ho= There is not a statistically significant relationship between the number of visits to the veteran peer-tutoring program and mathematics course grades for student veterans in the treatment group.

### **Participants**

The population for this study were student veterans enrolled in undergraduate mathematics courses at a four-year university. At the time of this study being conducted, the student veteran population numbered approximately 1,000,000 student veterans enrolled in postsecondary institutions (Cate, 2014). There were 38,661 students enrolled at this four-year South-Central university at the time of this study. The student veteran population at this university for the spring 2017 (N=2,701), fall 2017 (N=3,185), spring 2018 (N=2,876), and fall 2018 (N=3,625) served as the population sampled across four consecutive semesters, and included student veterans enrolled for the first time, in one or more of the mathematics courses selected and observed in this study. The participant sample size for this study was 56 (with 28 participants in the treatment group and 28

participants in the comparison group). The treatment group consisted of student veterans who used the veteran peer-tutoring program housed at the institution's learning assistance center within one of their first four semesters after matriculation. The sample also included a comparison group of student veterans who did not use the veteran peer-tutoring program within the same time frame. More details on the sampling and the matching procedures used to create the comparison group are described in the following sections.

### **Sampling Procedures**

A convenience sampling approach was used for this study because of the accessibility of institutional data on student veterans who had participated in a veteran peer-tutoring services program. The sampling method was aligned with the causal-comparative research design used in this study in that participant treatment grouping had been pre-determined by undergraduate student veterans who used the veteran peer-tutoring program. In addition, the comparison group consisted of student veterans that did not use the learning assistance veteran peer-tutoring service. All students had to meet the same inclusion/exclusion criteria to be included in the study.

**Inclusion/exclusion criteria.** For the purpose of this study only student veterans classified as undergraduates were the focus of data collection for the treatment group and the comparison group. Also, only participants using the veteran peer-tutoring for their first semester accessing the service for assistance in college algebra, precalculus, or calculus I, were a part of this study.

In addition, participants for this study were chosen from student veterans who were honorably discharged after completing their term of enlistment. This selection was

possible based on the fact that only honorably discharged student veterans are eligible for education benefits for which the veterans' affair office of the university maintains records. Participants were selected from those enrolled at the university as either full-time (12 credit hours or more) or part-time (11 credit hours or less) students over each of the four consecutive semesters.

Participants withdraw from class for a myriad of reasons, as such, participants with a grade of "W" may significantly skew the data resulting in biased estimates of outcome data pertinent to this study. For this reason, students with a grade of "W" were not included in this study as the focus was participants who completed the course with a letter grade (A, B, C, D, or F) in their first-semester attempt in college algebra, precalculus, and/or calculus I.

After careful consideration, student entrance exams and placement exams used by the university, were not used to determine selection of participants to this study. Student veteran records on placement test scores were limited at this university as some students transferred from different schools, or took their entrance exams while still in active duty under the Department of Defense (DoD), making it difficult to access their entrance exam scores or placement exam scores, making an even match of participants between groups less likely. Finally, student veterans who were commissioned officers in the United States military were excluded from this study due to having attained an undergraduate degree as a requirement in being commissioned as an officer, thus increasing the possibility of having previously taken college algebra, precalculus, or calculus 1. Dependents of veterans such as spouses and children using their veterans' educational benefits were excluded from this study. Data archived at the learning assistance center

categorized student veterans separately from military dependents and were used to exclude nonveteran dependents from this study.

### **Matching Procedures**

The comparison group was selected using a stratified randomized matching procedure that ensured each participant in the treatment group was matched with a student from the same course in the same semester. Moreover, if possible, students were matched on race/ethnicity by using Microsoft Excel's random selection process. When multiple students were eligible for matching, one was chosen at random, so that sample sizes would be equivalent in the treatment and comparison groups. Therefore, students were matched on three demographic variables: course (college algebra, precalculus, and calculus I), semester (spring 2017, fall 2017, spring 2018, and fall 2018), and randomly matched by ethnicity (White, Hispanic, African-American, Asian, Other). Students from all three mathematics courses across all four semesters were used (and collapsed in analyses) to increase the sample size. The matching procedures ensured that an equal number of students from each course and semester were represented in the treatment and comparison group, ruling out the type of course and semester as an explanation for group differences. There were two occurrences where the treatment and comparison groups were not evenly matched based on ethnicity. The precalculus groups in the spring 2018 semester had a treatment group consisting of one Hispanic and one White participant, and the comparison group had two White participants. The other occurrence was in the fall 2018 semester college algebra section, where the treatment group consisted of two Hispanic participants, one White participant, and two African-American participants. Conversely, the comparison group consisted of two Hispanic participants, one White

participant, one African-American participant, and one Asian participant. For example, a participant from each group were matched according to the college algebra course they took, in the spring 2018 semester that were classified as Hispanic. The results of the matching procedure yielded two comparable groups pertaining to course, semester, and ethnicity. Furthermore, in the treatment and comparison groups, there were more men (78%) than women (22%) represented in both groups. See Table 1 below for participation demographic data between groups.

Table 1

*Participation Demographic Data*

<b>Characteristic</b>	<b>Control (n = 28)</b>	<b>Treatment (n = 28)</b>	<b>Total (n=56)</b>
<b>Gender</b>			
Female	5 (22%)	5 (22%)	10
Male	23 (78%)	23 (78%)	46
Total	28	28	56
<b>Ethnicity</b>			
White	16 (57%)	17 (57%)	33
Hispanic	9 (32%)	8 (33%)	17
African-American	3 (11%)	2 (7%)	6
Asian	0 (0%)	1 (3%)	1
Total	28	28	56

Table 2 below, provides a breakdown of the number and percentage of

participants for the treatment group and the comparison group across all four semesters (spring 2017, fall 2017, spring 2018, and fall 2018) of this study, which includes the three courses (college algebra, precalculus, and calculus I) taken by the participants, and race/ethnicity as the third factor.

Table 2

*Number and Percentage of Participants in both Groups Across: Semesters and Courses*

<b>Course</b>	<b>Comparison group</b>	<b>Treatment Group</b>	<b>Total</b>
	<b>N=28 (%)</b>	<b>N=28 (%)</b>	
College Algebra	N=17 (61%)	N=17 (61%)	N=34
Precalculus	N=6 (21%)	N=6 (21%)	N=12
Calculus I	N=5 (18%)	N=5 (18%)	N=10
			<b>N=56 (100%)</b>

Table 3 below, provides a breakdown of both group's participant numbers and percentages for each semester (spring 2017, fall 2017, spring 2018, and fall 2018), and each course within each semester (college algebra, precalculus, and calculus I).

Table 3

*Number and Percentage of Participants in both Groups Per: Course and Semester (within)*

<b>Semester</b>	<b>Course</b>	<b>Comparison group N=28 (%)</b>	<b>Treatment Group N=28 (%)</b>	<b>Total N=56 (100%)</b>
Spring 2017	College Algebra	N=4 (14%)	N=4 (14%)	N=8
	Precalculus			
	Calculus 1	N=1 (.04%)	N=1 (.04%)	N=2
Fall 2017	College Algebra	N=4 (14%)	N=4 (14%)	N=8
	Precalculus			
	Calculus 1	N=2 (.07%)	N=2 (.07%)	N=4
Spring 2018	College Algebra	N=4 (14%)	N=4 (14%)	N=8
	Precalculus	N=2 (.07%)	N=2 (.07%)	N=4
	Calculus 1	N=1 (.04%)	N=1 (.04%)	N=2
Fall 2018	College Algebra	N=5 (18%)	N=5 (18%)	N=10
	Precalculus	N=4 (14%)	N=4 (14%)	N=8
	Calculus 1	N=1 (.04%)	N=1 (.04%)	N=2
				<b>N=56 (100%)</b>

Table 4 below, provides a breakdown of both group’s participants for each course by race/ethnicity.

Table 4

*Number and Percentage of Participants Per Group by: Course and Race/Ethnicity*

<b>Course</b>	<b>Race/Ethnicity</b>	<b>Treatment Group</b>	<b>Comparison group</b>	<b>Total N=56 (100%)</b>
		<b>N=28 (%)</b>	<b>N=28 (%)</b>	
College Algebra	White	N=11 (.39%)	N=11 (.39%)	
	Hispanic	N=4 (.14%)	N=4 (.14%)	
	African-American	N=2 (.07%)	N=1 (.04%)	
	Asian	N=	N=1 (.04%)	
	Other			
Precalculus	White	N=3 (.11%)	N=4 (.14%)	
	Hispanic	N=2 (.07%)	N=1 (.04%)	
	African-American	N=1 (.04%)	N=1 (.04%)	
	Asian			
	Other			
Calculus 1	White	N=2 (.07%)	N=2 (.07%)	
	Hispanic	N=3 (.11%)	N=3 (.11%)	
	African-American			
	Asian			
	Other			
				<b>N=56 (100%)</b>

### **Research Design**

A causal-comparative, between-subjects research design was used for this study to answer the two research questions (Creswell, 2009). Archival data, to include frequency of tutoring visits for mathematics courses by the participants, and participant demographic data from the spring of 2017, fall of 2017, spring of 2018, and the fall of

2018, were gathered from the learning assistance center. The four semesters selected for my study provided an overall small sample size to test the two research questions of this study. Although the sample size was low for statistical inference testing, it was relatively large given that so few students used this service, requiring four semesters of data collection in order to obtain a sample this large. The mathematics courses selected for this study were college algebra, precalculus and calculus I. The number of participants was determined for each of the four semesters based on initial use of the tutoring service, preventing duplicate enrollments of the same students across semesters and assuring the intervention effect measured first-time usage of tutoring for algebra, precalculus and calculus I. Lastly, both groups were matched based on the following variables: course, semester, and race/ethnicity. More details are provided in the matching procedures section above.

To answer the first research question, the independent variable observed was the veteran peer-tutoring services used by the participants for their mathematics courses. The dependent variable observed were the participants' end-of-semester mathematics course grades. Specifically, this study addressed the first research question by observing possible differences, if any, in final semester grades between the treatment group and the comparison group, based on the treatment group's participants use of the veteran peer-tutoring service. Also, this study attempted to answer the second research question by observing relationships between the frequency of tutoring visits (independent variable) student veterans within the treatment group received tutoring, and their final end-of-semester grades (dependent variable), to determine statistically significant differences, if any. Other variables were collected as part of this study for the purposes of describing

the characteristics of my sample and determining the comparability of the treatment and comparison groups, as any preexisting differences between groups could provide alternative explanations for the results. These variables included full-time/part-time enrollment, course instructors, and course sections.

Institutional data retrieved through the university registrar's office had the following data for all participants in this study. Categorized as nominal data, race/ethnicity was coded as follows: White (5), Latino/Hispanic (4), African-American (3), Asian (2), and Other (1). Gender was also categorized as nominal data and for the purpose of this study, was coded as Male (1) and Female (0). Age was categorized as a single ratio item as presented in the data retrieved from institutional research. After matching both groups based on course, semester, and race/ethnicity, the average mean age for the comparison group was 26 ( $SD=.408$ ), and for the treatment group, the average mean age was 29 ( $SD=.548$ ). Furthermore, the median age for the comparison group was 28, and the median age was 27 for the treatment group. Variables measured in this study include end-of-semester grades (ordinal) where mathematics grades had a code assigned to each letter grade as follows: A (4), B (3), C (2), D (1), and F (0) for all four semesters, and frequency of tutoring visits. For a list of variables used in this study see Table 5 below.

Table 5

*Complete List of Variables*

<b>Variable</b>	<b>Coding</b>	<b>Type of Data</b>
<u><i>Socio-Demographic Variable</i></u>		
Age	Whole numbers (in years)	Ratio
Sex	0=Female 1=Male	Nominal
Race/Ethnicity	1=White 2=Hispanic 3=African-American 4=Asian 5=Other	Nominal
<u><i>Independent Variables</i></u>		
Peer-Tutoring (Intervention Type)	1=Treatment 0=Control	Nominal
Frequency of Tutor Visits	Whole Numbers	Ratio
<u><i>Dependent Variables</i></u>		
End-of-Semester Grades	4=A 3=B 2=C 1=D 0=F	Ordinal

### **Description of the Veteran Peer-Tutoring Program**

In order to emphasize the importance of the qualifications of the veteran tutors provided peer-tutoring services to this study's treatment group, a brief description of the veteran-tutoring program follows. Veteran and nonveteran tutors attend monthly two-

hour professional development workshops designed specifically for peer-tutoring. Veteran tutors are compensated at a slightly higher hourly wage than their nonveteran tutor peers. Veteran tutors and nonveteran tutors must complete level one and level two College Reading and Learning Association (CRLA) national tutoring certification (CRLA, n.d.) to maintain employment at the employment at the large South-Central four-year university where this study was conducted. Level one certification includes maintaining a minimum 3.0 in-subject grade point average in the content tutored and overall, a record of at least 25 hours of actual tutoring in the tutoring lab, attending 10 hours of training mandated by the assistant director of the tutoring lab, observing as a lead tutor in their subject area for at least one hours, and conducting classroom and instructor visits respectively within the first two semesters of employment. Level two CRLA certification for veteran and nonveteran tutors entails an additional twenty-five hours of actual tutoring, an additional ten hours of training, attending an internal professional conference addressing tutoring approaches and strategies, and an additional classroom and instructor visit. The same tutor training assigned for veteran tutors and nonveteran tutors ensured that participants for the treatment group (student-veterans using veteran peer-tutoring) received quality tutoring services.

Veteran peer tutors primarily tutor student veterans depending on their funding source. If a veteran tutor's salary is funded by the university's VA, then the veteran tutor is required to tutor student veterans. If veteran tutors are paid through a science, technology, engineering, and math grant funding awarded to the learning assistance center, their priority for tutoring are student veterans and they will tutor nonveteran students in the absence of student veterans seeking academic tutoring assistance.

Nevertheless, both types of funded veteran tutors assist student veterans as their priority. Veteran tutors work fifteen to twenty hours weekly structured around their availability and based on their class schedules, with the exception being Saturday when the learning assistance center is closed. Participants in this study who used the veteran peer-tutoring services at the learning assistance center presented their student identification card at the front desk to check-in where they were assigned to a veteran tutor. The participant was then directed to the veteran tutoring office where they signed-in using their student identification card to record their: time of tutoring service, the subject requested for academic assistance, where confirmation of their veteran status was confirmed.

### **Instrumentation**

The learning assistance center at the university utilizes a software program that collects the descriptive data of the participants for a yearly evaluation of the program's effectiveness. The software captures the descriptive data of any participant using the veteran peer-tutoring program to include, mathematics courses and semesters the student veterans are enrolled, veteran status, date, time, and number of tutoring sessions attended. Furthermore, the software program allows administrators to see real-time data recorded. The data gathered from using this software system by the learning assistance center was instrumental in the selection of participants for the treatment group based on their use of the veteran peer-tutoring program. The software system also identified the type of tutor the student veteran used in every session through data captured and collected from scanning their identification card. This made it possible to determine if a student veteran was tutored by a veteran tutor or nonveteran tutor per session, based on where the student veteran was sent to the veteran peer-tutoring center, or not.

This study examined collected archived data in the form of mathematics grades for each individual participant of both groups, which were analyzed as averages to determine statistically significant differences of in end-of-semester grades between groups. Mathematics grades had a code assigned to each letter grade as follows: A (4), B (3), C (2), D (1), and F (0). Afterwards, numerical grade averages for each group were computed. For this study, student veterans receiving one-on-one peer tutoring were not distinguished from student veterans receiving group tutoring, as this study observed for statistically significant differences between the treatment group and comparison group as the primary focus. Participants for the treatment group were not limited to the number of times they received tutoring in this study.

### **Procedures**

For an overview of the procedures of this study, see Figure 1. Following institutional research approval, I requested demographic and descriptive data stored from the institution's learning assistance center director and university registrar's office supervisor via email, with an attached copy of the Institutional Review Board (IRB) approval letter for exemption with this study (see Appendix A). Both the learning assistance center director and registrar's office supervisor approved my request allowing me to gather archived descriptive and demographic data for the four semesters observed in my study. All demographic and course data were obtained from the university's registrar's office, and the tutoring data were obtained from the learning assistance center database. The data were coded and stored on a secure on-campus learning management system where only the principal investigator and his dissertation committee had access. The data management process involved removal of all identifiable data, and assigning

numeric code to each categorical level of course grades, race/ethnicity, and gender in order to quantify those variables. Stratified random matching procedures were also used to create the comparison group, as described previously. Once the variables were quantified, the participants in the treatment and comparison groups were determined, the coded data set was prepared for analyses by transferring the necessary data into IBM SPSS Statistics, v. 25. I then ran the analyses using the coded data for yielding results used to answer the research questions, to be discussed in the next chapter.

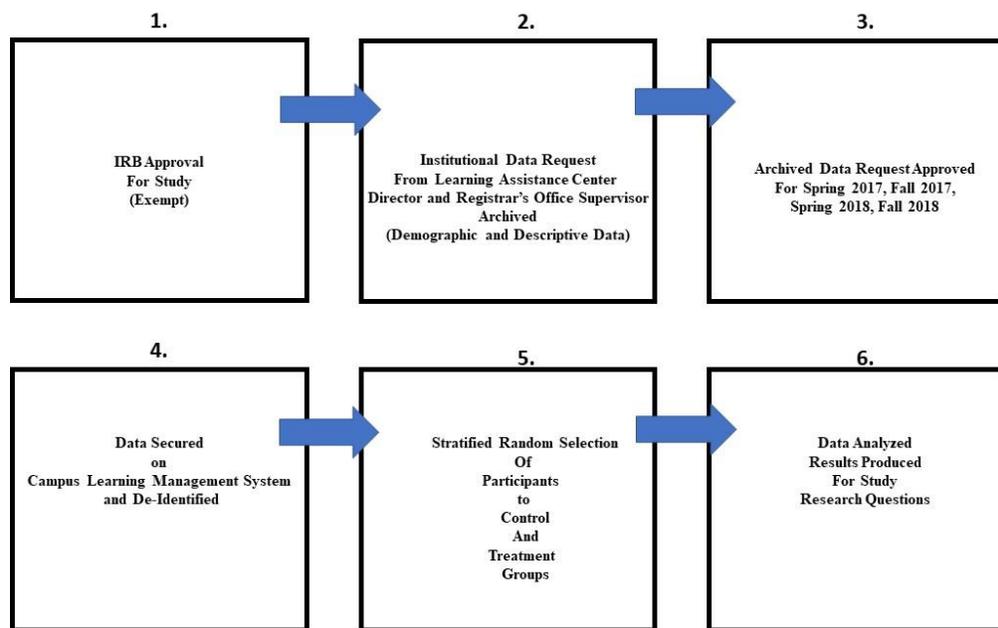


Figure 1. Overview of study procedures.

### Data Analysis and Testing Assumptions

Using a causal-comparison, between-subject design, my study measured the effect of veteran peer-tutoring on end-of-semester letter grades. Due to a small proportion of veterans at this institution using tutoring services, my study used multiple mathematics courses in college algebra, precalculus and calculus 1, across four long semesters to obtain a sample size large enough to run statistical inference tests to address each of my

two research questions.

To investigate my first research question, I used a Mann-Whitney U test to examine the difference in median scores between the treatment and comparison groups. There are two primary assumptions of Mann-Whitney U. First, all scores for both groups are independent, and second, the dependent variable is continuous level and non-normal (Field, 2013; Morgan, Leech, Gloeckner, & Barrett, 2004). The independence assumption cannot be tested for statistically; however, the study design helped to protect against violations of this assumption by ensuring individuals in the treatment group were not duplicated in the comparison (and vice versa) from one semester to the next. Because the data of this study met the assumptions of Mann-Whitney U and because this analysis procedure has been found to be robust with low sample size (Field), it was justified as the analytic choice for the first research question.

A Spearman's rho correlation analysis was used for the second research question of this study, given that tutoring visits used a ratio level of measurement and grades used an ordinal level of measurement, Spearman's rho correlation analysis was an appropriate choice for examining the relationship between these two variables. This analysis was only run for the treatment group. Specifically, this analysis was conducted to assess if there was a relationship between the frequency of tutoring visits (independent variable), and end-of-semester mathematics grades (dependent variable) within the treatment group. The assumptions for this analysis are that data on both variables are at least ordinal, and scores on one variable are monotonically related to the other variable, meaning that as the value of one variable increases, the value of the other variable should also increase, but

not necessarily in a straight line (Morgan et al., 2004). Spearman's rho correlation coefficient can vary from no relationship (0), to a perfect linear relationship (1), or a perfect negative linear relationship (-1). In addition to the statistical significance of the correlation, Cohen's standard was used to evaluate the strength of the correlation coefficient, where 0.10 to 0.29 represented a weak positive association between my two variables, 0.30 to 0.40 represented a moderate positive association, and 0.50 or larger represented a strong positive association.

### **Chapter Summary**

This chapter began by addressing the primary and secondary foci of my study. To address these foci, I compared a treatment group that used the peer-tutoring service with a comparison group that did not use the service. My two research questions, along with their respective hypothesis and null hypothesis, were stated pending the results of my study's analyses. The sampling and matching procedures for participant selection were explained by detailing the convenience sampling approach used for this study, the inclusion/exclusion criteria defining the qualifying factors for participants in both groups, and the stratified randomized matching procedure to ensure equity in both groups. The research design in this study, a causal-comparative, between-subjects design, was justified as the most appropriate design in answering my study's two research questions. A description of the veteran peer-tutoring program was provided, which included the qualifications for tutoring employment, tutoring certification through CRLA, and minimum 3.0 grade point average. The instrumentation and procedures of my study were detailed in describing where the data was housed, and how the data was retrieved using institutional research protocol. Finally, the data analysis and testing assumptions of my

study, Mann-Whitney U and Spearman's rho correlation, were explained as the most appropriate analyses in answering my two research questions due to low sample sizes.

The next chapter begins with a description of the preliminary analysis run on my study's primary variables. Testing for preexisting differences at baseline for both groups are detailed. Testing for violation of assumptions are further detailed. The results of my study's two analyses, Mann-Whitney U and Spearman's rho, used in answering my two research questions are provided.

## IV. RESULTS

This section begins with the preliminary analyses of this study where descriptive statistics and checks for preexisting group differences are described. A description on how the assumptions for how the primary analyses of this study, Mann-Whitney U and Spearman's rho, were tested, is followed by the hypothesis testing for this study's research questions. Finally, a summary addressing the results section will conclude this chapter.

### Preliminary Analyses

#### Descriptive Statistics

In this section, I report descriptive statistics for the primary variables: course grades and veteran-peer-tutoring-visits. Table 6 reports the grade distribution for the entire sample and Table 7 reports the grade distribution separately for each group. Overall, for both groups ( $N=56$ ), the grade mean, median, and standard deviation were ( $M=2.63$ ,  $Md= 3.00$ ,  $SD= 1.42$ ). Separately, the comparison group's ( $n=28$ ) grade mean, median, and standard deviation were ( $M= 3.00$ ,  $Md= 3.00$ ,  $SD= 1.089$ ). The treatment group's ( $n=28$ ) grade mean, median, and standard deviation were ( $M=2.25$ ,  $Md= 3.00$ ,  $SD= 1.624$ ). The median, mean, and standard deviation overall for both groups ( $N=56$ ), and for each group by visits and grades follows.

Table 6

*Frequency and Percent of Treatment and Comparison Group: Participant Overall Earned Grade (A through F)*

<b>Grade</b>	<b>Frequency</b>	<b>Percent</b>
A=	20	36%
B=	16	29%
C=	7	12%
D=	5	9%
F=	8	14%
<b>Total</b>	<b>56</b>	<b>100%</b>

Table 7

*Frequency and Percent of Each Group (Treatment and Comparison): Participant Earned Grade (A through F)*

<b>Grade</b>	<b>Treatment Group</b>	<b>Comparison group</b>
	<b>Frequency and Percentage</b>	<b>Frequency and Percentage</b>
A=	9 (32.1%)	11 (39.3%)
B=	6 (21.4%)	10 (35.7%)
C=	3 (10.2%)	4 (14.3%)
D=	3 (10.7%)	2 (7.1%)
F=	7 (25%)	1 (3.6%)
<b>Total</b>	<b>28</b>	<b>28</b>

Table 8 reports the frequency distribution for visits to the veteran peer-tutoring program. In the four semesters (spring 2017, fall 2017, spring 2018, and fall 2018) of this study with all three mathematics courses (college algebra, precalculus, and calculus 1) taken by both groups, the treatment group used the veteran peer-tutoring service 97

times. Only the treatment group data are available as comparison group participants did not use the veteran peer-tutoring service. For the treatment group, the mean, median, and standard deviation of visits to the veteran-peer-tutoring program were:  $M= 4.79$ ,  $Md= 2.00$ ,  $SD= 5.769$ .

Table 8

*Frequency, Visits, and Percentage of Treatment Group use of Veteran Peer-Tutoring Service*

<b>Frequency</b>	<b>Number of Visits</b>	<b>Percent</b>
11	1	39.3%
6	2	21.4%
1	3	3.6%
3	5	10.7%
2	7	7.1%
1	10	3.6%
1	13	3.6%
1	17	3.6%
1	18	3.6%
1	21	3.6%
<b>Total: 28</b>	<b>Visits= 97</b>	<b>Percent: 100%</b>

**Check for Preexisting Group Differences**

My goal here was to test for any preexisting differences between the treatment group and comparison group at baseline. As such, nominal variables (i.e., gender and race/ethnicity), and continuous variables (i.e., age), were used to test for any differences between the groups. I wanted to ensure that if any differences were found, it could not be attributed to gender, race/ethnicity, and age. Chi-square test results indicated there was no significant relationship found with gender between groups ( $\chi^2 = 0.583, df=1, p=0.445$ ). Chi-square test results also indicated there was no significant relationship found with race/ethnicity between groups ( $\chi^2 = 1.289, df=1, p=0.732$ ). Mann-Whitney U results further indicated there was no significant relationship with age between groups

( $M=28.66$ ,  $Md= 27.61$ ,  $SD= 6.748$ ). These findings confirm that the treatment and comparison group were not significantly different regarding age, ethnicity, and gender, and support the effectiveness of the stratified randomized matching procedure used to create the comparison group.

### **Testing of Assumptions**

In preparation of running a Mann-Whitney U test on my coded data to test grades between both groups, I conducted a check that the data met two primary assumptions of this analysis: (a) all scores for both groups are independent, and second, (b) the dependent variable is continuous or ordinal (Field, 2013; Morgan et al.). I helped to increase the likelihood that the scores for both the treatment group and comparison group were independent of each other by using a matching procedure that ensured no duplication between groups, from one semester to the next, occurred. The dependent variable was ordinal; therefore, the second assumption was met. In preparation of running a Spearman's rho correlation analyses on the data for the treatment group to answer this study's second research question, I tested the assumptions which were that (a) the data on both variables were at least ordinal (grades were ordinal and tutoring visits were ratio), and (b) there is a monotonic relationship between the two variables. Inspection of the scatter plot between course grades and veteran-peer-tutoring visits suggested a monotonic relationship among the variables, which supported that the second assumption was met.

## **Primary Analyses**

The following section will begin with the hypothesis testing for research question 1 using a nonparametric test, Mann-Whitney U, as the primary analysis in comparing grade distribution between both groups. Then, possible indications of the potential results of Mann-Whitney U are discussed. Next, the results of the Mann-Whitney U test in answering the first research question are addressed. The hypothesis testing for research question 2 using Spearman's rho correlation for frequency of tutoring visits and end-of-semester grades within the group will be discussed. Results for Spearman's rho analyses in answering the second research question will conclude the section.

### **Hypothesis Testing for Research Question 1**

In order to answer the first research question regarding veteran peer-tutoring impact on end-of-semester grades, I chose to use Mann-Whitney U Test, a nonparametric analysis, as the primary analysis to compare grade distribution between both groups. The Mann-Whitney U test compares mean ranks to determine statistical significance. Mean ranks are derived by rank ordering the data and calculating the mean of that rank-ordered data for each group. For the grade outcome variable, higher mean ranks indicate higher grades and lower mean ranks indicate lower grades. If a significant difference is detected between groups, it could indicate that (a) median grades are significantly different, (b) grade distributions are significantly different, or (c) both a and b. Given that median grades were identical in each group (the median was equal to 3 in each group), any significant differences observed would be attributed to the treatment and comparison group having different grade distributions, not different medians. This point is moot, however, because the Mann-Whitney U test results showed no statistically significant

differences in grade distributions between the treatment and comparison group; thus, the null hypothesis was retained (Mann–Whitney  $U = 299.0$ ,  $n_1 = 28$ ,  $n_2 = 28$ ,  $p = 0.11$ , two-tailed  $r = .25$ ). With the comparison group having a higher mean rank in grades (31.82) compared with the treatment group high mean rank in grades (25.18), the results indicated that the comparison group had higher end-of-semester grades than the treatment group in this sample (See Table 9). This difference revealed a small-to-medium effect size of  $r = 0.25$  (Field, 2013). However, this effect was not statistically significant. Therefore, no difference would be expected in the larger population.

Table 9

*Mann-Whitney U Results: Grade Ranks and Significance*

<b>Group</b>	<b>N</b>	<b>Mean Rank</b>	<b>Sum of Ranks</b>
Grade 0	28	31.82	891.00
1	28	25.18	705.00
Sig. (2-tailed)	.113		

*Note.* Asymptotic significance displayed in bold.  $p = 0.11$ , retain the null hypothesis.

### **Hypothesis Testing for Research Question 2**

For the second research question, I calculated a Spearman’s rho correlation for frequency of tutoring visits and end-of-semester grades within the treatment group. Twenty-eight participants’ archived data were observed for frequency of tutoring visits ( $M = 4.79$ ,  $SD = 5.77$ ) and end-of-semester grades ( $M = 2.63$ ,  $SD = 1.42$ ). Figure 2 shows the scatter plot between frequency of tutor visits and grades. A Spearman’s rho data analysis revealed no relationship ( $\rho = .317$ ,  $p = .113$ ) between frequency of tutoring visits and end-of-semester grades within the treatment group. Although this relationship was not statistically significant, it is interesting to note that the scatter plot shows that

four of the five students who had 10 or more tutoring visits earned an 'A' in the course and the other student earned a 'B'.

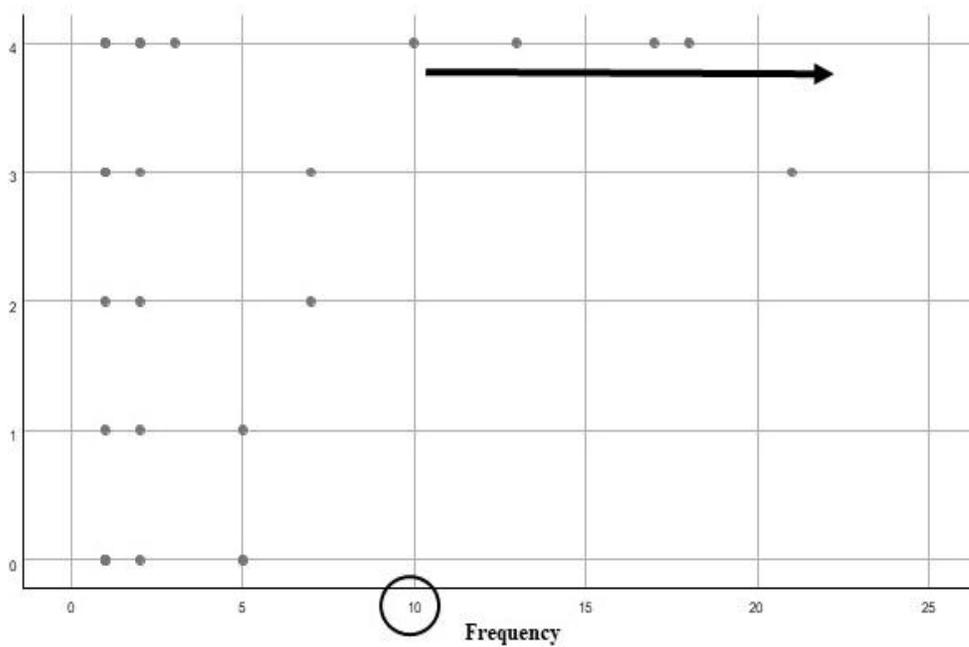


Figure 2. Scatterplot between frequency of tutor visits and end-of-semester grades within treatment group.

### Chapter Summary

First, the preliminary analysis run on the descriptive statistics for my study's primary variables course grades and veteran-peer-tutoring visits was described. The results of the analyses used to answer the two research questions of my study were addressed. Testing for preexisting differences between the treatment and comparison group at the baseline of this study, was detailed. The groups were found to be comparable with regard to course, semester, ethnicity, gender, and age. Also, testing for any violation of assumptions of my study's two analyses was reported. With the first research question, the results for Mann-Whitney U was reported with no statistical significant difference in grade distributions between groups found. With the second research question, Spearman's rho results for this study were reported for frequency of

tutoring visits and end-of-semester grades within the treatment group where no statistical relationship between the two variables was found.

A discussion of the results for Mann-Whitney U test with this study's first research question, and Spearman's rho correlation results for this study's second research question is in the next chapter. Also, the implications of this study's results, the limitations of this study, and conclusion of this study will be addressed.

## V. DISCUSSION

In this chapter, I discuss the scholarly and practical significance of my study in relation to the results obtained. I review the findings for each research question and discuss the potential reasons these results were observed and their connections with scholarly theory and research. I also discuss the practical implications of my study. Limitations, delimitations, and future directions are also explored. The chapter ends with a summative conclusion.

Peer-tutoring is an aspect of learning support in the field of developmental education (Arendale, 2010). The primary purpose of this study was to investigate the effects of peer-tutoring within a veteran peer-tutoring program, on student veteran end-of-semester mathematics grades. Increasing research on peer-tutoring and findings supporting the effectiveness of peer-tutoring; amplified the need for this study. With consideration of the dearth in scholarship on veteran peer-tutoring programs, and their impact on student veteran end-of-semester mathematics grades (Marx et al., 2016), this dissertation study provided an original investigation of one such veteran peer-tutoring program and its effects on student grade outcomes in university mathematics courses.

To examine my first research question, I created a comparison group of veteran students who did not participate in veteran peer-tutoring or any other form of tutoring offered through the learning assistance center. Also, using a matching procedure I ensured that no differences would exist between the treatment and comparison group with regards to course, semester, and race/ethnicity. Furthermore, I selected participants randomly for inclusion in the comparison group so that differences on other potential confounding variables would be reduced. Preliminary results supported that the groups

were not significantly different on gender, age, course, semester, and race/ethnicity making any differences between the groups unattributed to these variables.

The results of my first research question showed no statistical difference in grade distributions between the treatment and comparison groups. Accordingly, my study failed to reject the null hypothesis. In other words, the treatment group using peer-tutoring service; did not significantly outperform the comparison group.

A potential reason that these findings were observed may be supported by early research on student veteran academic performance for veterans of WWII, the Korean War, and the Vietnam Conflict (Fredericksen & Croce, 1950; Garmezy & Crose, 1948; Joaning, 1975). Early research findings on student veteran academic performance indicated that student veterans understood the course work; and invested more time in inquiry and instructor interaction than their traditional counterparts. Although instructor interactions and knowledge of the material were not measured in this study, these variables could potentially mitigate any negative consequence of not receiving veteran peer-tutoring and explain why no differences were observed.

Another potential reason these findings were observed is that the veteran peer-tutoring program was not effective at helping student veterans earn higher grades in their mathematics courses. Although not statistically significant, the direction of the effect of the treatment was opposite of the direction expected. In other words, the mean rank scores of the comparison group were higher than that of the treatment group in this sample, and the effect size was small to medium. Therefore, if the effect size and direction remained similar, increasing the sample size would help detect statistical significance in the opposite direction than expected, with the comparison group being

higher than the treatment group. Low sample size, is therefore, not an alternative explanation for the hypothesis not being supported.

Another potential reason for why no support was found for my hypothesis for research question 1 may be that student veterans choosing to receive the tutoring were struggling more in the course; or had lower mathematics proficiency to begin with. This alternative explanation cannot be ruled out because students' mathematics proficiency and difficulty with the coursework were not measured in this study. Also, such data did not exist within institutional records, given that student veterans are not mandated to enroll in developmental mathematics classes for college algebra, where mathematics proficiency can be measured.

The findings for the first research question differed from current student veteran studies focused on transitional experiences through qualitative measures positing that student veterans were not prepared to succeed academically in postsecondary institutions without the support of their veteran peers (Ackerman, et al., 2009). The median score for both groups in this study was a letter grade of "B," perhaps indicating that current student veterans may be continuing the academic trend found in earlier studies on WW2, Korean War, and Vietnam Conflict student veterans.

The findings of the first research question speak to Schlossberg's theory of adult transition for both the treatment and comparison groups. Specifically, Schlossberg's (2012) strategies factor through veteran peer-tutoring, as a coping response for the rigorous mathematics courses observed in this study, was evident in the decision made by the treatment group to use the tutoring service. As part of their overall transition process into their postsecondary institution, student veterans using the veteran peer-tutor program

as a strategy to help with their academic performance demonstrated their need to seek assistance in order to help with their transition. It is also possible that students from both the treatment and comparison groups may have applied Schlossberg's strategy factor through strategies other than veteran peer-tutoring, such as informal in-class peer-tutoring, or additional time spent with the class instructor, to successfully pass their mathematics course. However, these variables were not measured in this study.

Schlossberg's strategies factor contains four coping modes: information seeking, direct action, inhibition of action, and intrapsychic behavior. Information seeking, such as inquiring about tutoring, direct action, such as scheduling a tutor session, inhibition of action, such as rejecting the stigma of inferiority from seeking assistance, and intrapsychic behavior, such as reasoning out the need to seek tutoring assistance, are strong coping modes that may help student veterans move forward in using tutoring services.

The results of my second research question found no statistically significant relationship between frequency-of-use of the veteran peer-tutoring program; and end-of-semester grades for students within the treatment group. The findings failed to reject the null hypothesis which stated no statistically significant relationship would be found between the use of the service and final grades. A potential reason that these findings were observed may be that student veterans using the peer-tutoring service, did so in an inconsistent basis, where they sought assistance prior to a class assessment or exam. Another potential reason may be that veteran tutors did not successfully connect with their tutees through tutoring approaches that were not fully understood or conceptualized by the tutee. Or, as indicated from the findings of the first research question, the veteran

peer-tutoring program simply is not effective. There are a couple of reasons for this potential reason considering that 11 participants in the treatment group only recorded one visit to the veteran peer-tutoring program. One, the participants did not feel that the tutor assigned was effective in tutoring strategies they believed were necessary to successfully engage their mathematics courses. Second, the participants may have had a negative experience with their tutoring session, wherewith, they chose not to return. Alternatively, perhaps student veterans who continued to receive more tutoring were struggling more in the class and may have had lower mathematics proficiency to begin with. However, a difference between the finding of research question 1 and 2 is that the effect for research question 2, although not significant, was in the expected direction and had a medium effect size. Therefore, with a larger sample size, statistical significance could be reached in the hypothesized direction: this suggests a promising avenue for continued data collection.

The findings to this study were in contrast to previous research findings that showed a statistically significant relationship between frequency-of-use of peer-tutoring and final grades (Marx et al., 2016; Xu, Hartman, Uribe, & Mencke, 2001). However, the frequency-of-use of the veteran peer-tutoring program within the treatment group for this study; was not statistically significant. The findings for the second research question speak similarly to Schlossberg's (2012) adult transition theory as it pertains to the social factor, not addressed in this study, where camaraderie based on military experience may be preferred over academic assistance. Also, the social factor was ineffective as a coping method in Schlossberg's adult transition theory, in the case of this study, for student veterans possibly using the veteran peer-tutoring program for comradery, and no

statistically significant relationship found in visits and end-of-semester grades.

Finally, a vast majority of student veterans may feel that academic assistance is not necessary, and that seeking academic assistance from another student veteran may not be a priority for student veterans. Despite heavy advertisement of the veteran peer-tutoring program from university student veteran groups, some students may have an aversion to utilizing tutoring services, as has been documented for males and veterans (Wright, 2003).

Another possibility for why usage of veteran tutoring was unrelated to course grades may be that student veterans prefer to use informal peer-tutoring with their nonveteran classmates enrolled in the mathematics course (Agee et al., 2018; Topping, 1996; Topping et al., 1997). Student veteran preference to seek assistance from their instructors in rigorous courses such as the three mathematics courses observed in my study, may be a strong possibility, as studies have found that resilience levels and end-of-semester course grades increase when instructors are able to successfully navigate the student veteran through clear and specific instruction (Markel et al., 2010; Moore, 2013).

### **Implications**

There is clearly a need for academic assistance for student veterans accessing peer-tutoring programs (Agee et al., 2018). Enrollment numbers for student veterans increased over the four-semester time frame of this study as data in the methods section indicated, yet few student veterans used the veteran peer-tutoring program for the three mathematics courses included in this study. Overall, 28 (15%) student veterans used the veteran peer-tutoring service for assistance in college algebra, precalculus, and calculus 1, of the 178 total number of student veterans enrolled in the same mathematics courses,

over the same four-semester time frame. In the treatment group, 11 of the 28 participants only used the veteran peer-tutoring program once. It is important to note that not only are student veterans not using the peer-tutoring program, but those that use it once, are not returning in the same semester. These data imply a need for recruiting student veterans to use and continue using the veteran peer-tutoring (recommendations for recruitment are provided in the following section).

Another implication of the literature of this study is that there is still no clear reason as to why current student veteran population's graduation rates (low) and attrition rates (high) continue their current trend. Furthermore, we do not know which methods and training approaches have an effect on veteran peer-tutoring program delivery of more effective tutoring strategies to help their tutees. Given that this study found no effect of the veteran-tutoring program, many questions remain about how to improve this program and ultimately help increase veteran students' academic achievement and college completion. Below are some recommendations that may assist in continuing to address the serious problem of student veteran low graduation/high attrition rates through a continued focus on improving current and future veteran peer-tutoring programs.

### **Recommendations**

One recommendation, based on the low participation in veteran tutoring observed in this study with this particular veteran-tutoring program, is to place a stronger focus on recruiting veterans to use tutoring services. Helping students to create awareness of the services available to them and reduce any stigma associated with seeking assistance may be two areas to consider (Haeran, 2014). In addition, learning assistance directors and staff could work with classroom instructors to incentive the usage of these services, and

disseminate information about veteran peer-tutoring. However, to the extent that these services are not helping student veterans, they would need to be improved so they provide value to student veterans.

Because the findings from this study did not support the effectiveness of the veteran tutoring program, a planned collaboration amongst learning support professionals in designing a more effective peer-tutoring program should be explored, as scholarly literature on multi-stake holder input and participation may help reach this goal (Arendale, 2010). A collaboration, between developmental education researchers and learning assistance center directors; could help foster the development of more effective veteran tutors, by using their shared knowledge to better prepare veteran tutors to meet their tutees (student veterans) learning and transition needs. For instance, developmental education researchers versed in learning theories and research-based practices may serve as a useful knowledge base for learning assistance directors and their staff. Through administrative consultations and ongoing professional development, developmental education researchers could help learning assistance directors and staff incorporate research-based practices into their programs. In addition, a researcher-practitioner collaboration could involve ongoing research studies to inform the continued development of tutoring and other learning assistance programs. Ultimately, a major problem persists in that little is known about the effectiveness of veteran-tutoring programs and which methods might improve them over time. My study helps to take a first step towards addressing whether veteran peer-tutoring has an impact on students' course grades. Continued examination of these programs is vital to improving their success over time

## **Limitations**

There are several limitations that exist with this study. One limitation to this study was that some participants from both groups may have received alternative forms of tutoring service outside of the learning academic center from friends, peers, classmates, or family.

A second limitation to this study may have been the effect of the confounding factors for participants with mental and physical health issues beyond the scope of this study. Studies may be completed examining these factors as moderators and mediators based on the results of this study.

A third limitation to this study was the background knowledge of the participants with both groups in the mathematics courses taken over the four consecutive semesters. An additional study may be completed through a survey examining the effect of previous background knowledge of participants in mathematics courses over the same time frame of four consecutive semesters. The data may potentially yield statistically significant results providing a clearer indication of the effectiveness, or ineffectiveness, of the veteran peer-tutoring program.

A fourth limitation of my study was that treatment group participants were not randomly selected due to a low sample size. Demographic and descriptive data were used to evenly match participants in both groups through stratification, with random selection conducted with comparison group participants based on course, semester, and race/ethnicity. Therefore, the differences observed in both groups end-of-semester grades may suggest that veteran peer-tutoring is not effective, but there will always be the alternative hypothesis that those who choose peer-tutoring have preexisting differences

that make them more likely to not succeed in mathematics courses to begin with.

A fifth limitation of my study was the difficulty of determining which participants used the veteran peer-tutoring service prior to the four-semester time frame for this study, as the learning assistance center did not keep records on student veteran access to the veteran peer-tutoring service. A future study with additional semester data from the learning assistance center is needed to account for this limitation.

A sixth limitation to my study was the low power of my study due to a low sample size. Further studies with increased power stemming from more participants in both the treatment and comparison groups, may yield different results with possibly a statistically significant difference found in college algebra, pre-calculus and calculus 1 end-of-semester grades between groups.

### **Delimitations**

Delimitations to my study proposal included the use of a causal-comparison, between-subject design that examined end-of-semester mathematic grades of student veterans using a veteran peer-tutoring program located at a large South-Central University. Letter grades were used in this study as they were easily accessible from the registrar's office and are more effective than using grade point averages in determining statistically significant differences in student academic performance. Also, the decision to select this large South-Central University as the site, stemmed from a current gap in student veteran research where community colleges have been the current focus of interest. The veteran peer-tutoring program (independent variable) at this site has been established for six academic school years, which made it possible to examine relationships between participant use of the tutoring service, and their end-of-semester letter grades (dependent

variables) earned. College algebra, pre-calculus, and calculus1 were selected as specific courses of interest as these courses were the most sought courses for assistance at this specific postsecondary institution by student veterans; and because these courses have traditionally resulted in high academic failure rates for many students. This study addressed a research gap in student veteran peer-tutoring. As such, a baseline for participants' performance prior to my study could not be established due to current research on peer-tutoring not extrapolating student veterans from research study groups. The baseline for my proposal included individual semesters observed with different participants per semester, as end-of-semester college algebra, pre-calculus, and calculus1 grades for both the treatment group and the control group were collapsed to determine if there were any statistically significant differences in use of the veteran peer-tutoring program and end-of-semester mathematics grades between groups. Furthermore, to determine if there was a statistically significant relationship between frequency-of-use of the veteran peer-tutoring program, and end-of-semester mathematics grades within the treatment group.

### **Future Research**

I would like to see this study replicated with at least two additional semesters of data collected with additional participants added to both the treatment and comparison groups. A study with a larger power and effect size may yield different results or confirm the results of this study. I think it is important for a similar study on the effect of veteran peer-tutoring and student veteran end-of-semester grades for historically rigorous science courses such as college biology and chemistry to be conducted, in order to observe for possible similar outcomes as yielded with this study.

Future research comparing the effects of tutoring by veteran tutors with nonveteran tutors on student veteran end-of-semester grades in mathematics is important in my estimation, for determining if student veterans can receive the same effective tutoring from either tutor regardless of tutor veteran status. Additional data collected for this future study would include the experience (in time) of the tutors (veteran and nonveteran), data specific to whether a student veteran was assigned to a group format of tutoring or individual tutoring, preference of a specific tutor for tutoring assistance with a specific math/ science course, and a pre-mid-post survey given to both tutors and tutees, on their confidence level with the effectiveness of the tutoring sessions. Collection of data on both the tutor and the tutee, when analyzed, could determine perception and confidence levels on the effectiveness of the veteran peer-tutoring program. The findings of such study could help guide learning support professionals in better designing and implementing a more effective veteran peer-tutoring program.

On a larger scale for future studies, there are several veteran tutor programs in postsecondary institutions that may not observe similar outcomes as this study due in part to effect size or differing demographic data. Future veteran peer-tutoring program studies replicating this study's causal-comparative research design may provide a clearer indication of the effectiveness, or ineffectiveness, of veteran peer tutoring, as a means to increase success with student veteran academic performance.

Given the lack of data on admission and placement scores for some student veterans, a future study where a math proficiency test is administered on the first day of class for consenting student veterans, may provide baseline scores that could be measured at the end of the semester. In addition, student veterans using the veteran peer-tutoring

program may be required to take the same math proficiency test as their comparison group peers in order to provide a similar baseline. Student veterans can then be matched based on their mathematics scores in order to create a more robust comparison group.

Although this tutoring program requires nonveteran tutors and veteran tutors to participate in the same tutor training prior to the semester, and throughout the semester, as required through CRLA guidelines, this training may negate possible advantages of shared experiences for veteran tutors and student veterans, as the training undertaken is general in concept, and not tailored to student veterans. A future study focused on measuring the effectiveness of tutoring approaches between veteran tutors and nonveteran tutors, on student veterans and end-of-semester mathematics grades may yield findings that indicate the effectiveness or non-effectiveness of the veteran peer-tutoring program.

Finally, a future mixed-methods study focused on the application of Schlossberg's (2012) social factor, in conjunction with the strategy factor of this study, may help determine if veteran peer-tutoring helps student veterans because of their academic skill level in using the program; or due to social aspects of peer-mentoring by a fellow veteran found through comradery experiences shared during a tutoring session that might impact the outcome, end-of-semester grades. A longitudinal study, as a path analysis, beginning with the initial semester of veteran peer-tutoring use (as a mediating variable), subsequent semesters of veteran peer-tutoring use, and exit semesters for student veterans successfully completing their academic trajectory, may capture the complexity of performance outcomes.

### **Summative Conclusion**

The findings from this study suggested no effect of usage of veteran peer-tutoring service on students' mathematics course grades, which is contrary to what recent research studies have found with nontraditional and traditional students who utilize peer-tutoring (Fullmer, 2012; Hernandez Vargas, Martinez Espinosa, & Carranza Nunez, 2013; Nestel & Kidd, 2003; Truschel, & Reedy, 2015). Further studies with larger sample sizes and matching procedures that utilize measures of mathematics proficiency are needed to further explore the effectiveness of the specific veteran peer-tutoring program under investigation as well as veteran peer-tutoring program in general. In addition, a stronger understanding of the characteristics of effective veteran peer-tutoring programs should be explored.

In this study, the veteran peer-tutoring program had 15% of veterans using the services provided. Therefore, program recruitment is another area of consideration for practitioners. To address these issues, developmental educators and learning assistance directors should consider collaborating to design a veteran peer-tutoring program that helps foster mutual holistic support program for those student veterans who struggle in rigorous mathematics course, from developmental mathematics through higher-level mathematics courses such as calculus. This study provided an initial investigation of one such program and highlighted directions for continuing to refine this program and investigate its effects over time.

Finally, the major focus of my study was to address a serious national problem facing the student veteran population with low graduation rates/high attrition rates. It is important to determine why this specific postsecondary population, with earned educational benefits offsetting the costs of attaining an undergraduate degree, and

maintaining a cost of living, are simply not finishing college. My study's first step toward identifying factors contributing to this serious problem needs to be followed with further research focused on the academic performance of the student veteran, more so, than the transitional experiences of student veteran as current scholarship does.

I strongly encourage future research on student veteran academic performance via a collaboration of learning support professionals in seeking to identify what variables or factors are obstacles affecting student veteran academic performance. As active duty military personnel continue to complete their enlistment contracts, and begin the process of transitioning into civilian life and postsecondary institutions, the student veteran population will continue to increase. It is imperative that learning support professionals are prepared to meet the needs of this student veteran population by providing effective peer-tutoring programs grounded on strong learning theories tried in practice by providing effective tutoring strategies conducive to student veteran academic success.

## APPENDIX SECTION

### IRB APPROVAL LETTER FOR EXEMPTION

In future correspondence please refer to 2018362 January 30, 2018

Santos Cortez

[Institution Name]

Dear Mr. Cortez:

Your IRB application 2018362 titled “The Impact of Veteran Peer Tutoring on Mathematics Course Performance” was reviewed and approved by the [Institution Name] IRB. It has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects’ welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that you need to orient participants as follows: (1) signed informed consent is not required as this study analyzes secondary data; (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data; (3) Appropriate safeguards are included to protect the rights and welfare of the subjects. (4) Compensation is not provided for participation

This project is therefore approved at the Exempt Review Level

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments, please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Research Integrity and Compliance.

Report any changes to this approved protocol to this office. All unanticipated events and adverse events are to be reported to the IRB within 3 days.

Sincerely,

IRB Regulatory Manager

Office of Research Integrity and Compliance

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