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A LOGISTIC REGRESSION AND DISCRIMINANT FUNCTION ANALYSIS OF ENROLLMENT CHARACTERISTICS OF STUDENT VETERANS WITH AND WITHOUT DISABILITIES

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A LOGISTIC REGRESSION AND DISCRIMINANT FUNCTION ANALYSIS OF ENROLLMENT CHARACTERISTICS OF STUDENT VETERANS WITH AND WITHOUT DISABILITIES

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

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Abstract

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The postsecondary enrollment of student veterans has increased with the troop draw down in Iraq and Afghanistan as well as the generous amendments made to the Post 9/11 GI Bill. Acquired disabilities remain a reality for this population as they transition into the civilian world; consequently, previous literature cites the role of disabilities amongst student veterans. Also, prior research often aggregates these two groups without a thorough understanding of the ways in which they differ.

This study compared student veterans with disabilities to student veterans without disabilities in order to understand the enrollment and demographic factors on which they differed, if any. Using a secondary data analysis of the 2007-2008 National Postsecondary Student Aid Survey, univariate tests of significance, a logistic regression, and a discriminant function analysis examined the relationship between disability status and seven predictor variables: age, gender, GPA, major, risk index, degree program type, and whether or not a student was exclusively a distance learner. These seven variables as a whole were not significant predictors of disability status; however, the models provided valuable insight into the similarities and characteristics shared within this population.

Univariate tests of significance revealed that students with disabilities had a significantly lower mean GPA, were more often male, tended to favor certain academic majors over others, more often enrolled in bachelor's degree versus associate and certificate programs, and had a lower risk of attrition based on their index of risk. Major, degree program type, and risk index proved to be the most significant predictors of disability status in LR and DFA. A student veteran's age and whether they were a distance learner had no significant bearing on disability status indicating that student veterans enroll in distance learning or campus-based programs without influence from an orthopedic or mobility impairment, the most common type of disability amongst student veterans. This study offers a full description of student veterans with disabilities including the specific types of disabilities with which this population enters higher education.

CHAPTER 1

INTRODUCTION

The American military has been engaged in war in both Iraq and Afghanistan for since 2001; military personnel have served combat deployments to both these theaters. These deployments place service members in mentally, emotionally, and personally trying situations and physically dangerous environments far removed from the conventions of American civilians. As armed forces personnel separate from military service and transition to the civilian world, their veteran status provides them with a variety of opportunities. More specifically, those who choose to take advantage of their education benefits or rehabilitation opportunities will receive job retraining or an upgrade in skills through higher education.

Since the conclusion of World War II, society has tried to ease transition of combat veterans and other service members into civilian life using tools such as the G.I. Bill (Bound & Turner, 2002; Smith-Osborne, 2009). The bill has undergone several revisions in response to the needs of the time, conflict, and constituency with the most recent version, the Post 9/11 G.I. Bill, providing record incentives to today's veterans. Several provisions of the G.I. Bill and other education benefits programs offer benefits through the Montgomery G.I. Bill for active duty and select reserve, the Reserve Education Assistance Program, the Veterans' Education Assistance Program, and a program specifically for survivors and dependents of military members. When World War II veterans began returning home with injuries such as sensory loss and disfigurement, the question arose of how to assimilate these veterans back into society. The G.I. Bill promoted the college classroom, private sector, and housing market as methods of transition.

Bound and Turner (2002) assessed the effectiveness of the first-generation G.I. Bill in facilitating educational attainment for the droves of male veterans returning from the Asian and

European theaters. World War II's G.I. Bill encouraged access to higher education for the diverse population of combat veterans in the mid 20th century. Similarly, the Post 9/11 G.I. Bill has also been used to encourage civilian transition for veterans of Iraq and Afghanistan. After September 11, 2001, those who served at least 90 active, aggregate days and were released with an honorable discharge or those who served 30 days with a service-connected disability became eligible for the extended benefits. The Post 9/11 G.I. Bill incentivized postsecondary enrollment through a monthly housing allowance, an annual book stipend, paid tutoring and testing services, as well as tuition for a total of 36 months. These veterans can use their financing for any program approved by the U.S. Department of Veterans Affairs (V.A.), including accredited programs delivered solely through an online learning environment.

In addition to the G.I. Bill, rehabilitation allows veterans who have acquired injuries to retrain in industries which can accommodate their non-congenital disability. The government benefits provided to veterans upon leaving the military have historically allowed this population to open businesses, purchase homes, and, essentially, advance their lives outside of the military. The expansion of the G.I. Bill and other transition initiatives continues the tradition of providing for veterans after their dutiful service but especially after physical sacrifice. The most updated G.I. Bill acknowledges the nature of education today; distance learning courses for veterans who choose not to go to a bricks and mortar program are covered under the program. Even those veterans enrolled in exclusively distance learning education can receive a housing and book stipend as well as a tutoring allowance, in order to minimize financial burden during postsecondary education.

Brief Review of the Literature

Student veterans

Student veterans flock to institutions of higher education when their military commitment ends, and they are faced with the challenge of securing a civilian career or translating their skill set to the civilian world. The presence of student veterans on college campuses has forced higher education faculty, administrators, and other personnel to explore the best ways to support this demographic which comes with diverse abilities, disabilities, and life experiences. The American Council on Education (ACE) (2009) reported nearly two million military service members and their families were eligible for the new Post 9/11 G.I. Bill which augments educational benefits for those who have served in the Iraq and Afghanistan conflicts. According to Radford and Wun (2009), about 4% of all undergraduates were veterans, active duty, or reserve members of the military during the 2007-2008 academic years. Institutions across the country from Arizona State University to the University of North Dakota have credited the new Post 9/11 G.I. Bill with their record enrollment rates of student veterans (Sabo, 2010). Most student veterans are eligible for federal student aid as well as veterans' benefits which are both essential to their ability to successfully access and persist in higher education.

Since student veterans typically fulfill their military commitment prior to enrolling, they do tend to be older than the traditional undergraduate when they first enter college. Over 50% of student veterans are older than 30 and over 60% of them are married and/or have children who depend on them financially (Radford & Wun, 2009). Their nontraditional status may imply a variety of other conflicting responsibilities during their postsecondary attainment such as familial responsibilities, employment demands, and isolation from traditional undergraduate peers. In a

report by ACE, financial constraints, time management, civilian transition, and convoluted bureaucracy served as obstacles to military undergraduate enrollment and persistence (2008).

In terms of demographics, student veterans share similar characteristics with adult learners who return to higher education with the challenge of assimilating to traditional academia with considerable life experience. Similar to other nontraditional students, military students are more likely to attend public 2 year institutions for associate's degrees more so than the traditional undergraduate student; however, they tend to gravitate toward bachelor's degree programs at a higher rate than their independent undergraduate peers (Radford & Wun, 2009). Because veterans can use their benefits for any approved program designed to augment or develop their professional skills, student veterans can also be found amongst the graduate student population.

Although prior research and anecdotal evidence recognizes the presence of war-related injuries such as spinal cord injury (SCI), traumatic brain injury (TBI), and post traumatic stress disorder (PTSD), military veterans enrolling in postsecondary education can also suffer undiagnosed or undisclosed disabilities which may have existed prior to military service (Madaus, et. al, 2009). Because of physical standards for military admission, veterans can still suffer from invisible disabilities such as a learning disability or attention deficit disorder for which they might have compensated during their military careers and personal lives. Like all individuals over the age of 18 enrolled in college, student veterans reserve the right to not disclose any known disabilities (U.S. Department of Education, 2011).

Combat related injuries among student veterans

In general, military student enrollment has dramatically increased at postsecondary institutions as veterans from Iraq and Afghanistan transition to civilian life; furthermore, institutions located near Veterans' Affairs (VA) Polytrauma Centers have experienced significantly increased enrollment of veterans with disabilities (Church, 2009). The prevalence of disability tends to be higher in the student veteran population; according to Radford and Wun (2009), 15% of student veterans reported having some type of disability compared to less than 11% of those in the general undergraduate population who reported a disability. Researchers base these figures on self-report and voluntary disclosure of a disability for both student veterans and those in the general undergraduate population. Veterans who involuntarily exit the military may do so because of a medical discharge due to a life altering injury. These injuries exclude them from continuing their military service and force them to pursue new careers. Although the advances in combat and protective technology have decreased the risk of fatality in modern warfare, the injuries associated with survival can leave service members struggling with very serious injuries such as cognitive, mobility, or sensory injuries or even amputation.

The signature injuries of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) are not detected by the naked eye nor are they indicated on any college application; however, both PTSD and TBI can affect an individual's academic experience whether it's through the navigating the registration process or functioning in the classroom. Furthermore, the adjustment to a new cognitive process or physical condition will influence all endeavors regardless of their military status or educational goals. Whereas educational pursuits prior to an injury may not have required accommodations or a customized learning environment,

acquired injuries like SCI and TBI will have lasting effects on every aspect of their lives including the pursuit of a college degree.

The signature injuries may affect inherent processes in the academic setting. Disabilities such as TBI can affect the cognition required to think critically and manage new ideas. The all too common diagnosis of PTSD can severely affect the social and emotional skills required to participate in a meaningful way in an academic classroom. The affects of these invisible injuries as well as any physical disabilities will have lasting repercussions on an individual's ability to fully access the academic experience. Although prior research and anecdotal evidence recognizes the presence of war-related injuries such as SCI, TBI, and PTSD, military veterans enrolling in postsecondary education may still suffer with cognitive disabilities such as learning disabilities or attention deficit hyperactivity disorder which may have existed prior to military service (Madaus, et. al, 2009).

After working a series of dead end jobs and dropping out of college, Matthew Reilly enlisted in the Army in 2005 in order to gain G.I. Bill benefits (Sander, 2012). The Chronicle of Higher Education documents his struggles returning to the classroom after he sustained a serious injury to his spine in Iraq in 2008. Prior to his life-altering injury, Matthew Reilly worked as a combat medic and had planned on enrolling in school to become a nurse practitioner. Reilly spent fifteen months in Walter Reed Army Hospital in Washington, D.C. recovering from his back injury and further delaying his college entrance. Now 33, his road through higher education has been affected by both his military experience and acquired disability, but he identifies his new mission in college as solely doing homework, going to class, and completing his educational goals (Sander, 2012). By attempting to better understand student veterans with and without

disabilities, institutions can avoid the general stereotypes attached to student veterans like Matthew Reilly when they enter the college classroom.

Rationale for the Study

Returning to college or entering for the first time with an acquired physical or cognitive disability is a very real possibility for student veterans. College personnel unfamiliar with the military or V.A. system must learn the inner workings of these organizations in order to understand their process for determining disabilities and the complexities behind receiving necessary documentation in a timely manner (Shackelford, 2009). In order to effectively provide proper support services to student veterans especially those with disabilities, members of the academic community must be knowledgeable of the characteristics, challenges, and strengths of student veterans especially as they pertain to acquired disabilities. It is especially important to understand how these students differ from both their nontraditional undergraduate counterparts as well as the traditional undergraduates whom college personnel are more accustomed to supporting. Also, student veterans with disabilities may or may not make different enrollment decisions that their student veteran peers without disabilities. According to Mamiseishvilli and Koch (2011), it is critical to obtain an accurate profile of who these individuals are and what factors affect their persistence in college from first to second year especially as the rate of enrollment increases among students with disabilities.

Stewards of the higher education community must take into account the prevalence of disability among student veterans when identifying risk factors which may inhibit access, persistence, and matriculation. Radford and Wun's (2009) comprehensive profile on military students enrolled in postsecondary education taken from the National Postsecondary Student Aid

Survey (NPSAS) does not describe the types of disabilities disclosed by student veterans. The NPSAS collects disability data for respondents when available, but these variables are not discussed at length in any of the previous research done on this growing population of undergraduates.

In addition to the more traumatic signature injuries of the OIF/OEF combat veterans, members of the higher education community must be knowledgeable of all of the enrollment characteristics of this growing population in academia. A thorough analysis of the types of self-disclosed disabilities among military students can inform higher education practice in terms of the types of support services needed. From 2000 to 2009, the percentage of students with disabilities in postsecondary education increased from 9% to 11%, but experts in disability studies anticipate an increase in this figure with the passage of new legislation such as the Americans with Disabilities Act Amendments Act, the Higher Education Opportunity Act, as well as the new Post 9/11 G.I. Bill (Mamiseishvilli & Koch, 2011). It is important to understand what proportion of students with disabilities in postsecondary education is, in fact, veterans of the military in order to tailor programs to their needs and abilities. A well-prepared campus for student veterans can provide the support system veterans need to answer questions about school-related issues, academic challenges, and socio-emotional health (Zinger & Cohen, 2010).

The question remains as to whether or not military undergraduates with disabilities share the same characteristics as their peers. Veterans' rehabilitation research needs a thorough analysis of the enrollment characteristics of student veterans with disabilities and how their demographic and academic needs differ from other undergraduates. It is important that disability support service professionals, teaching faculty, and higher education administrators understand the needs and characteristics of student veterans if they are dealing with acquired disabilities

during their transition to civilian and academic life. Many times, student veterans hesitate to disclose any disability which might provide them classroom accommodations due to the perceived stigma left over from their experiences in the military (Shackleford, 2009). Therefore, research must highlight the data that is currently available in order to establish a need for additional data collection and encourage a cultural shift which may lead to increased requests for accommodations to promote success for student veterans with disabilities.

Research Questions

The purpose of this study was to examine the factors on which student veterans with disabilities differed from their student veteran peers without reported disabilities. The main research question was: What are the best demographic and disability status predictors of student veterans with disabilities versus those veterans without disabilities? This inquiry inherently answered other research questions which were more descriptive of the student veteran population. The analysis explored how the demographic and enrollment factors of student veterans with disabilities differed from their veterans peers without disabilities and whether student veterans with disabilities were at a higher risk for attrition from higher education. It also explored whether or not having a disability affected the choice in the type of higher education institution a student chose to attend.

Research Design

This design was a non-experimental, quantitative analysis of secondary data. This study used data from the Institute of Education Science's (IES) National Postsecondary Student Aid Survey (NPSAS) from the 2007-2008 survey administration years. The dataset contained student-level records primarily on student funding sources along with demographic

characteristics. The over 800 variables which included demographic information such as marital, disability, and veteran status were collected through institution records, web-based surveys, as well as computer-assisted telephone interviews. Student data was analyzed using descriptive methods as well as univariate and multivariate inferential techniques in the SPSS 19 software package. Analyses included frequency distributions and descriptive statistics in order to characterize the survey population as well as chi-square analyses and t-tests. A logistic regression (LR) and discriminant function analysis (DFA) were the main multivariate statistical techniques used in this study.

Study results must be interpreted with the limitations of this particular design. Secondary data analysis offers many benefits for researchers without the cost of implementing an entire survey or data collection activities; however, secondary data analysis also reduces the amount of control over variable construction and can challenge the validity of survey results if the inquiry does not align with the original research's purpose or population. Also, this study took a subsample from a much larger data set so issues with weight in regards to oversampling and non response bias are present. However, weights were rebased using the population estimate of student veterans amongst all undergraduates.

Definition of Terms

Dependent Student. A dependent student is defined by their financial dependence on their family. More specifically, they do not meet any of the criteria to be an independent student (Federal Student Aid, 2011).

Disability status. This study will use the NPSAS definition of disability status as a sensory impairment or a long-lasting condition that substantially limits one or more basic physical activities such as walking, climbing stairs, reaching, lifting, or carrying or other

physical, mental, emotional, or learning condition that has lasted six months or more (NCES, 2011).

Independent Student. This study will maintain the federal aid definition of independent students as financially independent of their parents on the basis of age (24 years or older), marital status (married), and whether they had dependents (Radford, 2011). Nonmilitary independent students are those students who are independent as well as have no financial affiliation with the military. Federal aid gives confirmed veterans independent student status.

OIF/OEF.. Operation Iraqi Freedom and/or Operation Enduring Freedom. Military conflicts in Iraq and Afghanistan respectively. (Steele, Salcedo, Coley, & Rand, 2010)

Student Veteran. Currently enrolled students who are veterans exited from the military or students who are currently on active military duty or in the reserve force of any of the armed forces branches (Radford, 2011).

Wounded Warrior. An injured combat veteran of the Iraq and/or Afghanistan wars. (Vance & Miller, 2009)

Chapter Two

Review of the Literature

Method for Review of the Literature

The search strategy for this review of the literature was conducted through an electronic search of literature databases, an electronic search of other dissertations, and a manual search of published literature. This method of review was designed to identify the literature relating to veterans and other nontraditional students as their enrollment changed the traditional landscape of academia. This review also sought out applications of student development theories as they affect undergraduates in their education choices.

First, an electronic search of Academic Search Complete, Education Research Complete, and Social Work Abstracts yielded 59 articles using the search term "student veterans." These articles were published between 1949 and 2011. Within these results, only five articles contained the term "disabilities;" these articles were published recently, between 2008 and 2009. Although this study will use data collected in 2007 and 2008, the postsecondary characteristics of veterans in the WWII and Vietnam era is also of interest because of the access to higher education created by the GI Bill in 1944. A search of these same databases using the terms "military" and "postsecondary" or "college" yielded six results from 1973 to 2009.

Next, an electronic search of the Education Resources Information Center (ERIC) yielded almost 800 results for all documents containing the phrase "student veterans." Within these results, 56 documents contained the term "disabilities" dating back to 1973. Of these sources, only eight related to this research topic specifically. For all databases, thesaurus terms "veterans" and "postsecondary" yielded less results and literature which was exclusive to veterans' benefits. An electronic search of academic databases yielded over two dozen articles relevant to the

enrollment characteristics of student veterans with disabilities in postsecondary education. An electronic search of dissertations yielded 18 works containing the phrase "student veterans;" seven were retained for this research. A dissertation search using the terms "veterans" and "post secondary" returned only 11 works, but only a critical race theory analysis was retained for this study. Since the niche population in question, veterans of the Iraq and Afghanistan conflicts, is relatively new, the electronic search of relevant literature produced sufficient results in terms of timeliness. After consulting with an expert on disability and higher education, several practitioners' texts and research articles on disability in postsecondary education were included.

The first section in this review of literature describes the presence of military veterans in post secondary education. The second section in this literature review outlines some prominent characteristics and theories of post secondary students with disabilities. The third concept in this review of literature cites the need for research which merges both student veterans and students with disabilities as possibly a distinct group unto themselves.

Veterans in Post Secondary Education

World War II Veterans

The establishment of the Servicemen's Readjustment Act of 1944, or what is commonly referred to as the GI Bill, greatly increased educational opportunities for veterans returning from the theaters of World War II. Economists and historians alike credit the post WWII GI bill with changing the landscape of higher education and increasing the educational attainment among adults who were otherwise unlikely to attend college (Bound & Turner, 2002). Military veterans come to higher education with experiences unique to their delayed entry and military occupations.

According to Toven (1945), the veterans of World War II (WWII) left their military service primed for entry into higher education. At the time, however, members of the armed services did not have to be high school graduates. Today's veterans of the armed forces will hold at least a high school diploma or its equivalency while many will have some experience at the postsecondary level. Upon their return to college, Toven suggested that veterans with some previous higher education "should not present any special problems in orientation and adjustment" (1945, pp. 345). This dated approach does not account for today's variation in college rigor or any acquired disabilities which may alter a veteran's academic aptitude. The reception of injured veterans of the Iraq and Afghanistan wars by colleges and universities has also changed due to progressive legislation and social awareness about people with disabilities. At the conclusion of WWII, higher education personnel expected student veterans to fit within a physical and cognitive norm because other federal agencies catered to veterans with physical and mental disabilities (Toven, 1945). Institutions of higher education catering to today's veterans must expect a greater variation in demographic background as well as physical and academic ability.

Webb (1946) suggested keeping "emotionally unstable" veterans from college admission by citing their "physical ailments which may produce incompetence in academic work" (p. 239). Applying this practice to OIF/OEF veterans would be at the very least illegal if not immoral. For higher education admissions officials to assume incapability based on a diagnosed disability seriously undermines legislation such as the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. Both pieces of legislation protect all students with disabilities from discrimination based on a disability in a qualified academic setting (U.S. Department of Education, 2011). Webb's suggested practices would exclude veterans with emotional and

cognitive scars from participating in higher education. While veterans with mental and emotional scars may have better access to college education today, few WWII veterans with sustained injuries even bothered applying to colleges after their service (Webb, 1946). Similar to veterans of today's wars, WWII veterans also counted higher education as their best chance for economic security after wartime service (Webb, 1946).

Mencke (2010) applied critical race theory to qualitative interviews with African American WWII veterans who were eligible for the GI Bill at the conclusion of their service. She discovered that systematic and institutionalized racism hindered African American veterans from using their GI Bill benefits to access higher education. Although many African American soldiers served in the U.S. military during WWII, the lack of reception to these veterans in higher education maintained the homogeneity of undergraduates during that time period. By denying African American WWII veterans a place in higher education, this country's educational system was able to maintain a status quo and minimize diversity in postsecondary classrooms (Mencke, 2010).

Despite the obstacles minority veterans faced in using their GI Bill after WWII, the benefits awarded to veterans after their service helped to increase educational attainment during that same time period when compared to nonveterans regardless of race (Bound & Turner, 2002). Contrary to Mencke's findings that racism obstructed African American veterans' maximum utilization of the GI Bill, Bound and Turner attribute the legislation with democratizing the "collegiate population by making college a viable option for men from a range of sociodemographic backgrounds, including minorities, first-generation Americans, and those from low-income households" (p. 785). WWII veterans who were born between 1923 and 1927 received more postsecondary education and were more likely to graduate from college than

nonveterans within the same birth cohort; Bound and Turner (2002) attribute this outcome to the subsidies provided by the original GI Bill.

OIF/OEF Veterans

The body of literature surrounding Operation Iraqi Freedom and Operation Enduring Freedom veterans will take a considerable amount of time to reach the levels of research dedicated to WWII veterans. More sociologists and education researchers are attempting to characterize these veterans as they transition back into the ranks of civilian life. This is especially true as the military reduces its manpower in response to a shrinking conflict.

Ryan, Carlstrom, Hughey, and Harris (2011) applied Schlossberg's transition model to help academic advisors understand the dynamics of military veterans' foray into higher education. The authors suggest that although a majority of eligible veterans access their educational benefits, the marginal amount of those who deplete those benefits implies that college campuses are not ready for this population since these individuals arguably exit without receiving a degree. The authors apply Schlossberg's theory of trigger events preceding transition as a possible motivation behind a veterans' choice to leave the service and pursue a new life path. Higher education officials must distinguish between veterans who willingly choose to leave the military due to timing versus those who were forced out of their positions due to a trigger event which may have resulted in a life altering disability.

While Ryan et al. (2011) use transition counseling to increase military student readiness of college campuses, Lokken, Pfeffer, McAuley, and Strong (2009) describe the collaborative relationships necessary to justify the label "veteran-friendly" campus by today's terms. The authors cite the collaboration of an accepting university, an active student veterans' organization, as well as an accessible Department of Veterans' Affairs. Through a 21-item, web-based survey

of Minnesota student veterans, researchers found that financial guidance, benefits expediency, and social services were among the areas this population most needed support. Half of respondents consisted of primarily National Guard or Reserve members indicating a current military status while 12 % of respondents identified themselves as "disabled veterans" (Lokken et al., 2009, p. 50). While veterans with disabilities may also be concerned with financial guidance, benefits expediency, and social services, a higher percentage of respondents with disabilities might prioritize needed supports differently.

In a 2011 secondary data analysis of the last National Postsecondary Student Aid Survey as well as the Beginning Postsecondary Students Longitudinal Study, Radford (2011) characterized today's student veterans as mostly male, married, and older than the traditional undergraduate population. Although undergraduate student veterans tended to major in computer and information sciences more than nonmilitary students (Radford, 2011), student veterans with disabilities may or may not be attracted to other fields of study when compared to their peers without reported disabilities. Despite Bound and Turner's (2002) assertions that the GI Bill made higher education accessible for WWII veterans, only about 40% of all OIF/OEF undergraduate student veterans actually used GI Bill benefits to pay for school (Radford, 2011).

In a Rand study, Steele et al. (2010) analyzed data from focus groups (n=22), interviews (n=8), and a survey (n=230) conducted with partial sponsorship from the American Council on Education. Researchers used this multi-pronged approach to better understand how the Post 9/11 GI Bill was helping to shape the experiences of student veterans. In both focus groups and web surveys, veterans reported having issues transitioning to higher education from the military; more specifically, focus group participants discussed the difficulties with balancing academic and personal responsibilities as well as managing service-related injuries such as PTSD. The

researchers (2010) discuss the implications of any service-related injuries on the higher education experience in a limited context; the discussion focused on how those injuries may inhibit academic participation, increase social isolation, or create frustration with the V.A. system.

Ackerman, DiRamio, and Mitchell (2009) conducted 25 qualitative interviews with undergraduate student veterans. Their findings support the Steele et al. study (2010) in that participants voiced their frustration in navigating the bureaucracy of both the unfamiliar higher education system and the complex world of veterans' affairs. The authors also shared the Lokken et al. (2009) definition of a veteran-friendly campus – one that proactively recruits and supports veterans through a formal infrastructure meant to ease their transition into and engagement in higher education. These student veterans also revealed that habits developed during their war-time service such as hyper-vigilance, insomnia, and isolation affected their abilities in the classroom. These symptoms of combat may have lasting adverse effects on classroom learning; whereas, the authors limit the discussion on disability as a cause for involuntary separation from military service (2009).

Zinger and Cohen (2010) also used a similar research design which triangulated the Ackerman et al. (2009) findings. In their structured interviews of 10 community college students, research participants revealed very serious issues with drug and alcohol abuse in order to cope with the effects of post deployment. These issues were only compounded by the obstacles students encountered when trying to navigate the admissions process to a college with minimal support of student veterans or knowledge of the veterans' system. Zinger and Cohen (2010) discuss the possibility of invisible injuries which veterans may choose not to acknowledge or disclose; a student veterans' decision to withhold disclosure of an acquired disability may hinder

their time in the classroom. The experience of wartime service, acquired injuries, unsolicited reverence, and overt criticism further isolates the veterans from their classroom peers (Zinger & Cohen, 2010). These factors undoubtedly change the higher education experience for this population which may be at a higher risk for attrition given their isolation in the community college or university classroom.

While Sorey and Duggan (2008) did not use student veterans as a population specifically, they did conduct their longitudinal study of community college attrition on adult students versus traditional-aged students. Student veterans typically fall into the nontraditional or adult category since their military service usually disqualifies them as a dependent student and delays their entry into college until after completion of service (Radford, 2009). Surprisingly, the data indicated an adult students' level of social integration as the most powerful indicator of persistence (Sorey & Duggan, 2008). The marginal response rate of just over 17% casts some doubt on the study's findings especially since a power analysis does not appear evident and findings may be at greater risk for sampling error based on the cases that were retained; still, this study highlights the need for social integration for adult students who may be marginalized due to their smaller numbers in the classroom. This group includes student veterans who may need a support system such as a student veterans' group to reinforce their decision to return to college or engage in the classroom.

The 2010 report of the National Survey of Student Engagement (NSSE) discusses student veterans' engagement in academia at greater length. Among their chief findings, student veterans tended to spend more hours outside of the classroom working at a job or caring for dependents since they are adult students with complex responsibilities; yet, this population tended to invest just as much time in their studies as non student veterans. NSSE's findings acknowledge the

presence of disability among the student veteran population in that 20% of combat veterans reported at least one disability compared to only 10% of nonveterans. Regardless of disability status, first-year student veterans perceived less support from their academic institutions, and first-year combat veterans in particular reported less engagement with faculty than their non veteran peers. This highlights the contrasting environments and personalities within both the military and academia; also, the bureaucracy involved in initially accessing benefits and learning a college system may cause students to feel dissatisfied with their level of support. The lower level of importance placed on reflective learning and higher order thinking by student veterans emphasizes cultural differences and unique military cognition; in contrast, nonveterans considered these deeper approaches to learning as an important factor in education (NSSE, 2010).

The NSSE (2010) findings support Tinto's model (1975) which includes personal engagement, social integration, academic support, and cultural assimilation as differential predictors of academic success. Tinto draws a useful distinction between academic failure and voluntary withdrawal, both possibilities for student veterans who might leave higher education before completing their desired degree program. The literature on student veterans in higher

education underscores the need to tailor academic services to this population's unique needs.

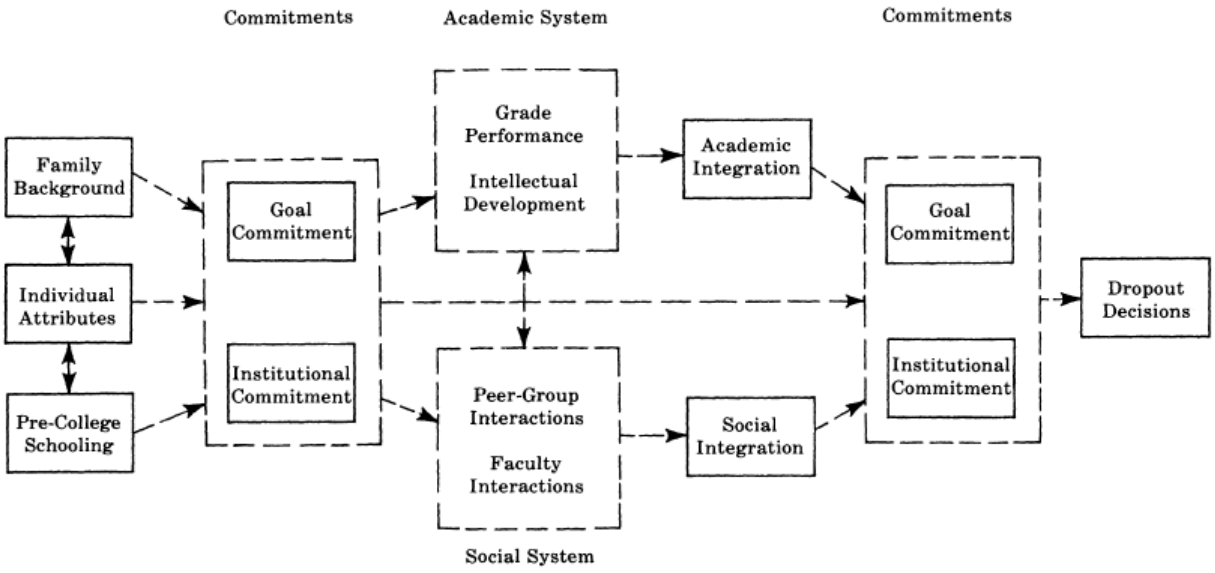

Figure 1. Tinto's conceptual schema for college dropout. (Tinto, 1975, pp. 95)

The process outlined in Figure 1 shows all the possible breaking points for student veterans as they make their way through the academic process. The ability to manage all the prerequisite qualities including possible combat experience, then choose a vocation and institution, and then perform and interact in that institution summarizes the risk for attrition. Tinto constructs the theoretical model from traits seemingly related to persistence, traits related to collegial interactions, and then traits of the institution. This model emphasizes the need for institutions to fully understand the populations in their enrollment and how to best encourage a successful outcome among them. In regards to student veterans, a veteran-friendly campus which acknowledges the uniqueness of veterans with disabilities can play a role in the decision to drop or stop out from higher education.

The research at present indicates many of the demographic and enrollment characteristics of student veterans with a marginal amount of dialogue mentioning disability. However, the prevalence of acquired disabilities amongst student veterans warrants deeper analysis of this

subgroup's enrollment and demographic characteristics. Onset of disability can be a life-altering and perspective changing event which may or may not cause this group to make academic decisions systematically different from their peers without disabilities. Researchers of student veterans stress the frustration associated with the cultural, social, and academic transition from the military to higher education; however, this research only superficially covers disability as the compounding factor it can be.

Students with Disabilities in Higher Education

Key legislation such as the Americans with Disabilities Act, Section 504 of the Rehabilitation Act, and the Individuals with Disabilities Education Act helped facilitate a surge of enrollment for students with a diverse set of abilities into higher education (Government Accountability Office, 2009). Prior to the enactment of these antidiscrimination policies, a postsecondary education eluded many capable individuals with either cognitive or physical disabilities. Enrollment at two and four year colleges became more diverse when postsecondary institutions began to eliminate many of the barriers faced by these students.

In the 1995-1996 academic year, about 6 percent of all undergraduates reported having some kind of disability (NCES, 2000). These undergraduates with disabilities enrolled at 98% of public two and four year institutions and only 43% of private two year colleges and 67% of private four year colleges enrolled students with disabilities, according to a 1998 study by NCES. The most common disability reported was a specific learning disability; incidentally, 88% of the institutions reported accommodating students through alternate exam formats or extended time. Public institutions were more likely than private institutions to provide accommodations or services to students who needed them. Regardless of public, private, or degree-granting status, almost all of the institutions which enrolled students with disabilities also provided additional

training or educational materials to relevant faculty and staff, but only two-thirds of these institutions delivered this information through formal workshops or presentations. This survey research of postsecondary students with disabilities is limited by the fact that institutions used different reporting standards to calculate their relevant enrollment; some institutions reported only students to whom they were providing accommodations while others reported students with disclosed yet unverified disabilities.

By the 2007-2008 academic year, almost 11 percent of undergraduates reported having some type of disability (Raue & Lewis, 2011). Students with disabilities enrolled at almost all public two and four year institutions in the survey. In 2009, the percentage of private two and four year colleges enrolling students with disabilities also grew. The percentage of institutions enrolling students with a specific learning disability grew to 86%; interestingly, 79% of institutions reported having students with ADD or ADHD. In terms of accommodations for these students, extended exam time was still the most commonly used service. A large majority of the institutions, 79%, encouraged student disclosure by distributing informational materials on campus. When compared to the results in the 1998 survey, this collective data suggest an increase in the integration of and service to students with disabilities in postsecondary education. However, it is unclear if these materials targets or encouraged certain groups such as student veterans.

Postsecondary institutions must meet a variety of needs as their enrollment grows more diverse each year. In a report to the Committee on Education and Labor in the House of Representatives, the Government Accountability Office (GAO) (2009) suggested that U.S. higher education institutions needed more streamlined assistance and technical support in providing services to students with disabilities. The GAO used both qualitative and quantitative

methods such as site observations, expert interviews, survey data, student interviews, school official interviews, and a literature review in their evaluation of higher education's handling of students with disabilities. Many school officials, particularly disability support service professionals, voiced concern over having the necessary training to support the growing population of students with autism as well as the expertise needed in coordinating with veterans' organizations. Among the findings, school officials requested a central clearinghouse or widespread dissemination of best practices that might be replicated when dealing with emerging subgroups of students with disabilities. In response to the report, the U.S. Department of Education agreed to assemble a team focused on supporting postsecondary students with disabilities; this team would be comprised of representatives from relevant offices within the agency including the Office of Vocational and Adult Education, the Office of Postsecondary Education, the Office for Civil Rights, and the Office of Special Education and Rehabilitative Services. This multidisciplinary team recognized the presence of adult learners with disabilities amongst those students entering college for the first time.

Higher education and disability support professionals can use a postsecondary-disability clearinghouse to facilitate positive outcomes for individuals who may have acquired a disability which forces them to reevaluate their professional trajectory. Krause and Reed (2009) asked individuals with adult on-set spinal cord injury (N=1362) to report their employment status as well as several other variables of interest. The individuals in the sample suffered a traumatic event resulting in a SCI. The authors applied a logistic regression to the factors which best distinguished those who had obtained post-injury employment from those who had not. Those individuals with SCI who obtained their bachelor's degree post-injury were nine times more likely than their counterparts without any post-injury education to be employed. These findings

indicate that educational attainment prior to a SCI injury leads to post-injury employment less often than when an individual completes a degree program after their injury. This study underscores the need for individuals with acquired traumatic disabilities to pursue and complete educational goals in order to maximize their chance for post-injury employment and independence. Although the sample size appears sufficient and group sizes are not overly disproportionate for the logistic regression, the authors fail to discuss a power analysis; an overpowered sample may exaggerate each individual variable's effects on the function.

For veterans who are forced out of the military due to a life-changing acquired injury, setting new educational goals by pursuing higher education can help renew self-actualization. However, accepting a life-altering disability can prove challenging when considering a career in the military assumed a level of fitness for duty. While self-esteem and social support increase the likelihood of acceptance of disability, perceived stigma of disability can severely hinder an individual's adjustment (Li & Moore, 1998). In order to conduct a multiple regression on the variables pertaining to acceptance of disability, researchers adapted several measures to create one survey which measured acceptance against other situational and attitudinal factors. Cronbach's alphas of .84 and .79 supported the internal consistency of the new constructs, self-esteem and hostility. While younger, married and higher income respondents showed more positive attitudes toward their disabilities, gender, race, and level of education did not significantly affect attitudes toward acceptance Still, Krause and Reed's research (2009) on post-SCI education leading to greater employability relates to Li and Moore's findings. Greater achievement in education can lead to greater employability and income potential for people with SCI and disabilities in general. Li and Moore (1998) aggregated types of disabilities and levels of acceptance in subsequent regression models. Among the 1266 respondents, the research

distinguished between single and multiple disabilities as well as congenital conditions; however, there may be a vast difference in the attitudes of the 13% who reported a learning disability versus the 13% who reported a SCI or back injury.

In their research on barriers to higher education, Megivern, Pellerito, and Mowbray (2003) focused their inquiry to the experiences of those with psychiatric disabilities. The study used a qualitative design to solicit the experiences of 35 individuals with confirmed psychiatric disabilities who withdrew from higher education. Participants most often cited their psychiatric symptomology as the primary reason for leaving college; however, lack of academic and social integration and competing life responsibilities also challenged the participants. Only two of the 35 respondents disclosed their condition to college faculty and staff; consequently, the pool of students rarely used the campus support services available to students with documented disabilities. Almost half of the participants went on to paid employment after they left school while the other half received financial support from the government while unemployed. Although the researchers mainly used qualitative interviews, they also included the results of several significant and nonsignificant independent samples *t*-test whose data was gathered through coding the qualitative interviews. The authors analyzed univariate mean differences between disability onset and factors such as persistence, interference, service utilization, and semesters completed. Although they reported the results of *t*-tests for all four of these variables, only the number of semesters completed by those whose onset of symptoms during college (M=5.58, $S.D.$= 2.67) was statistically higher than those whose symptoms occurred before enrollment (M=3.2, $S.D.$= 1.43); $t(24) = 3.24$, $p < .01$. The study's sample consisted of those who had been out of college for anywhere from four years to up to 23 years (M=10.37,

SD=5.46); this places significant burden on the recall ability of the participants who averaged about 10 years since their last college enrollment.

Rather than relying on a heavily burdened recall by students who may have exited college more than 20 years ago, Mamiseishivelli and Koch (2011) performed a secondary data analysis on a national postsecondary data set from 2004-2005. The authors followed several X^2 tests with a multivariate logistic regression in order to identify the factors affecting first-to-second year persistence for college students with disabilities. The study presents descriptive data on the responses of those students with disabilities on several factors such as academic and social integration. The students were predominantly White, first generation college students with an average age of 24 years old (*SD.*=9.72). Academic and social integration as well as the use of disability accommodations each had a significant interaction on first-to-second year persistence; however, they did not prove significant when controlling for demographic and situational characteristics in the final regression model. Females were almost two times more likely to persist than males; black students were more than two times more likely to persist than White students; full-time students living on campus were more likely to persist; high GPA and higher degree aspirations also significantly increased the odds of persistence. Interestingly, every thousand dollar increase in tuition resulted in a higher likelihood of persistence by a factor of 1.109. However, older students were less likely to persist where a one year increase in age resulted in decreased odds of persistence by a factor of .834.

The increased likelihood of stopout among college students with disabilities may indicate that students considered in the non-persister group were incorrectly classified. This is a limitation in using this particular data set which only covers a limited range of academic years. The authors also cite their use of secondary data analysis for this particular data set as an inherent limitation

in that the variables available were predetermined by the survey designers. While this particular research used a similar approach in their data source and analysis, the findings did not disaggregate results for student veterans who may or may not have dissimilar characteristics than the survey sample.

Getzel and Thoma (2008) conducted a qualitative study on the role of self-determination for college students with disabilities. The authors purposefully sampled the focus group pools from community colleges as well as four-year universities; the students ranged in age from 18 to 48 years, but the overall majority of the students were less than 23 years old. In terms of the advocacy skills needed, students indicated that seeking services on campus, engaging with faculty and staff, developing support systems, and being self-aware were important factors for persisting in college. Despite the younger age of the participants when compared to student veterans, these findings underscore the need for acceptance of disability and heightened self-awareness for a successful college student with a disability. These students tended to not disclose their disability until they were already in academically precarious situations; consequently, higher education and disability services officials can help encourage disclosure before academic failure becomes a threat. Although the themes elicited from these focus groups provide good insight to the experiences of having a disability in college, the characteristics and behaviors of older students with possibly acquired disabilities warrants further research. This study sheds light on the skills student veterans with disabilities can acquire in order to increase their persistence in college. Whereas previous research on students with disabilities in higher education focused on specific disabilities or the quantification of risk factors, this study highlights the attributes of successful students with disabilities in higher education.

Disability researchers have studied the effects of hidden or undisclosed disabilities amongst the postsecondary population (Getzel & Thoma, 2006; Lynch & Gussel, 1996). Those with newly acquired disabilities are not alone in trying to forego the academic disclosure process. Postsecondary students with disabilities often view disclosure as a breach in their privacy or sign of weakness (Lynch & Gussel, 1996). An individual with a hidden disability in an environment with limited or stigmatized disabilities can learn to deny or compensate for as long as academically possible. Self-advocacy requires an acceptance of disability and self-awareness including an understanding of the consequences of refusing compensatory accommodations. The consequences of hiding a disability are not limited to those traditional undergraduate students; military veterans accustomed to a physical or cognitive norm may also have difficulty developing the acceptance and self-awareness required of disclosure.

As a field of research, disability in higher education grows everyday as enrollment rosters become increasingly diverse. Even for younger students with disabilities groomed during high school for postsecondary transition, certain obstacles may impede a college graduation. However, the research is consistent about self-determination, self-advocacy, and social supports as strategies for increasing the likelihood of persistence. Student veterans with disabilities may differ from the typical student who visits the disability services office on campus; still, many of the research about the skills needed for success in college despite a disability will benefit the veteran immediately.

Student Veterans with Disabilities and Higher Education

As the survival rate among combat veterans increases, the number of veterans with life-altering injuries needing to transition back into the civilian world will also increase (DiRamio & Spires, 2009). The presence of disabilities among veterans entering higher education necessitates

a serious examination of the policies and research surrounding their enrollment and support. Madaus, Miller, and Vance (2009) draw comparisons between student veterans and adult learners who share many of the same qualities. Disability services offices from schools around the country continue to develop programs designed to encourage the success of student veterans in higher education. The authors suggest that higher education institutions should pursue alternate sources of funding in order to tailor more services and carve out more positions specifically addressing the enrollment of student veterans. By utilizing veteran specific personnel and social support outlets such as student veterans' clubs, institutions uphold the person-first mentality rather than letting the disability dictate the educational experience of the veteran. As a matter of both necessity and legality, disability services officials must learn the intricacies of the veterans' administration system especially as it pertains to disability determination. Although a veteran may not qualify for having a formally recognized service-connected or non service-connected disability through the eyes of the V.A. system, not providing accommodations to these individuals could possibly violate their civil rights. Still, student veterans must voluntarily disclose a disability to the college in order to receive accommodations in the classroom.

The rise in enrollment of student veterans with disabilities warrants the concern by higher education disability support professionals. Vance and Miller (2009) surveyed members and affiliates of the National Association on Higher Education and Disability and received less than a 10% response rate (N=237). The authors developed the 29-item instrument which consisted of five separate constructs; rather than using other validation methods such as a factor analysis, experts on Wounded Warriors as well as higher education and disability contributed to validating the instrument. Although the authors surveyed disability support officials on wounded warriors rather than the wounded warriors themselves, they made a special effort to identify the personal

military background of the respondents. While most of the respondents were females without combat experience, more than half of the sample indicated they had family members with military experience. The findings of this study suggest that disability personnel often refer student veterans with disabilities to other resources or offices on campus. Service coordination for veterans occurred out of the campus registrar's office rather than the disability support office; furthermore, over 40% of the respondents indicated their offices were not adequately prepared to serve the influx of student veterans because of resource challenges and lack of training. For future research, the authors suggest more specific inquiry on the enrollment of student veterans with disabilities but more specifically, female student veterans with disabilities.

Smith-Osborne's research (2009) may not have focused on female veterans with disabilities only, but she did investigate the mediation effects of several support factors for all veterans with disabilities in higher education. The author compared the full sample of Gulf War era veterans with those considered to have more significant disabilities rated at over 50% by the V.A. Among the most notable findings in this secondary data analysis, a regression model revealed that non-labor income and informational social support had mediated or reduced the liability of disability on educational attainment. Consequently, the educational attainment of veterans with disabilities was suppressed by having more dependents in their care. These findings indicate that the reduction in additional responsibilities outside of higher education and the increased financial and personal investments can help mitigate the effects of disability on educational attainment for veterans. Resources like social security disability assistance and V.A. disability pensions reduce the financial burden on veterans with disabilities. These sources of income supplement G.I. Bill benefits and allow the veteran to focus solely on meeting their educational responsibilities. Having additional income and social support can relieve many of the

stresses that adult learners may face regardless of whether or not they have a disability. Being that many of these veterans are older students returning to the college classroom, they are more likely to have children; however, these responsibilities can be managed with the proper support and resources in place. Since this study used data from before the recent benefit expansions of the Post 9/11 GI Bill, a new analysis can evaluate how the current level of benefits influence educational attainment for veterans with disabilities.

Research on veterans with disabilities makes some assumptions as to the type of disabilities because of an assumption of cognitive and physical fitness based on their military admission. Still, preexisting conditions such as a learning disability can affect a veteran's academic performance especially if they were treated as non conditions throughout their military careers. While disability support officials prepare to accommodate signature war injuries such as traumatic brain injury and post traumatic stress disorder, they must remain wary of other invisible injuries to which the veteran themselves may not be fully aware (Madaus, 2009). Using a sample of 47 male veterans, Adler, Kunz, Chua, Rotrosen, and Resnick (2004) examined the relationship between childhood symptoms of ADHD and adult on-set PTSD using X^2 analysis as well as studentized *t*-tests. This pilot study revealed a significant association between having ADHD as a child and developing PTSD as an adult. Even more relevant to college education, those with cases of adult ADHD were at a higher likelihood to also have a diagnosis of PTSD. Still, this study drew a sample which significantly differed in age among the groups and cannot be generalized to female veterans. While college personnel may not contribute to the PTSD resilience training of combat service members, they can be aware of the possible secondary disabilities student veterans may bring with them such as ADHD. Despite any methodological

limitations, these findings have hugely relevant implications for disability support personnel who may have to anticipate other latent disabilities in addition to signature war injuries.

Literature on the enrollment characteristics of student veterans dates back to the last world war, well before the current conflicts in Afghanistan and Iraq (Bound, 2002; Mencke, 2010; Webb, 1946; Toven, 1945). Much of the available literature on student veterans has focused on the role of the GI Bill on diversifying enrollment in higher education. Other literature comes from the institutional perspective and the upsurge of a new subpopulation on campus (Ryan et al., 2011; Lokken et al, 2009). Some of the most comprehensive research on this particular era of combat veterans entering postsecondary education has overlooked the presence of disability amongst this student group (Radford, 2009; ACENET, 2008). The characteristics addressed within these reports neglect the rate or types of disabilities which student veterans may bring with them to the classroom.

While many researchers draw comparisons between student veterans and adult learners (Radford, 2009; Madaus et al., 2009), a purposeful data analysis of the enrollment characteristics of student veterans with disabilities can eliminate and/or confirm many of the generalizations often assigned to this niche population. Much of what is known about postsecondary students with disabilities is still in its early stages since key legislation has only recently helped usher these students onto college campuses. Literature on postsecondary students with disabilities has also focused on the transition challenges of this population going from high school to a college setting (Shaw, Madaus, & Dukes, 2010). Student veterans with disabilities may qualify for many of the services that benefit these younger students; however, the approach will have to acknowledge their considerable amount of life experience as well as the circumstances leading to a suddenly acquired or unacknowledged congenital condition. Also, the student veterans'

transition from a very autonomous, militant setting into the relatively unstructured environment of academia greatly differs from the transition needs of the traditional aged college student experiencing newfound independence or adulthood.

Disability determination and documentation serves as another obstacle for both providing student veterans with accommodations and student veterans' ability to access accommodations. Vance and Miller (2009) warn that disability support service providers should not expect the typical disclosure process or secondary education documentation typically experienced with the traditional aged undergraduate with disabilities. Instead, those who must determine reasonable and appropriate accommodations for students must learn the veterans' administration's complex bureaucracy of benefits and regulations (Ackerman et al., 2009). The difference in professional language and standards between academia and military can potentially impede needed supports to student veterans in immediate need. Likewise, the documentation and regulations within the postsecondary institution may prove equally esoteric to the veteran.

While some research of veterans with disabilities does not directly apply to the postsecondary education and other research of students with disabilities does not apply directly to veterans, the *Journal of Postsecondary Education and Disability (JPED)* dedicated their 22nd volume to student veterans with disabilities specifically. *JPED* publishes articles classified as either original research, integration of research, proposals of innovation, or analysis of policy. Of the seven articles published in the special issue, only one article (Vance & Miller, 2009) gathered data to present original research on the issue of student veterans with disabilities. Although the journal offered practical insight to the issues involved with serving student veterans with disabilities from a pragmatic standpoint, the issue highlights the need for original research on the population directly. In order to maximize the effectiveness of these higher education support

services, research can identify the characteristics on which student veterans with disabilities may differ from their student veteran peers without documented disabilities.

A higher education practitioner's publication, *New Directions for Student Services,* dedicated its 126th volume in the summer of 2009 specifically to issues dealing with veterans on college campuses. Only one out of 10 articles focused on veterans with disabilities specifically. DiRamio and Spires (2009) under scored the types of disabilities higher education officials would encounter while working with student veterans. They also identified best practices in serving wounded warriors on college campuses. However, the article discusses these issues from a practice standpoint and uses neither a quantitative or qualitative methodology to illustrate the trend of student veterans with disabilities.

The literature and research by higher education practitioners' journals indicate a stronger need for inquiry which determines how or if student veterans' needs differ from other undergraduates or from each other based on disability. Shackelford (2009) directly addresses the issue of attaining proper documentation for accommodating student veterans in the classroom. Knowing the types and prevalence of disabilities in the population can reduce speculation and increase preparedness to meet the needs of this group. A truly veteran friendly campus would build its programs around the needs of the student veterans as they contend with possible multiple disabilities on their way to attaining second careers (Ruh, Spicer, & Vaughan, 2009). Original, concentrated inquiry on student veterans in higher education can supplement the tacit knowledge gained by institutional personnel in regards to the types of services and supports needed.

The nature of the current research on student veterans in higher education and students with disabilities in higher education underscores a need for a descriptive study on student

veterans with disabilities. Few higher education officials protest the moral obligation to or unique distinction of military students who have suffered an injury due to their service to the country. However, the characteristics on which these students differ from nonmilitary undergraduates with and without disabilities can help higher education officials prepare more "veteran-friendly" campuses to receive them as enrollment of this population increases. By acknowledging the costs of wartime service through continued research of PTSD, SCI, and TBI, the veterans' education discourse can include a respectful discussion of any acquired disabilities and possible congenital disabilities not diagnosed during military service. A logistic regression (LR) and discriminant function analysis (DFA) can highlight the characteristics on which student veterans most differ including rates of disability, type of disability, and other demographic factors which may place them at a higher risk of attrition according to the previous literature.

The impact of disability on an undergraduate's postsecondary attainment has been well documented in the literature (Getzel & Thoma, 2008; Mamiseishvilli & Koch, 2011; Megivern et al,. 2003; Wessel et al., 2009). Radford (2011) and ACE (2009) discuss the role of student veterans in the postsecondary classroom especially as it pertains to their risk of attrition. Previous research has shown that most of the variables used in this study have proven statistically different from other non-military undergraduate populations. Instead of comparing student veterans once more to their non-military peers, this study compared them to each other based on disability in hopes of highlighting how an acquired disability may affect their enrollment choices or personal characteristics.

CHAPTER 3

METHODOLOGY

The focus of this study was to identify the factors on which student veterans with disabilities differ from student veterans without disabilities. Understanding the enrollment characteristics of student veterans with disabilities in postsecondary education will allow higher education administrators to better anticipate the needs and behaviors of this population. A discriminant function analysis would emphasize meaningful group differences and a logistic regression should corroborate any distinctive variables. The proposed study focused specifically on the enrollment and demographic characteristics of student veterans with disabilities since little quantitative research has disaggregated this group from the larger student veteran population.

The research design (described later) was proposed to answer the following research question: What are the best demographic and enrollment status predictors of student veterans with disabilities? Through the methods used in this inquiry, this research revealed which demographic and enrollment factors student veterans with disabilities differed from their veteran peers without disabilities. More specifically, student veterans were compared on seven different factors in order to assess whether disability status was related to the type of educational program student veterans attended and if they were at a higher risk for attrition.

Research Design

This study utilized a nonexperimental, quantitative research design to investigate what relationships exist between disability status (reported disabilities and no reported disabilities) and multiple predictor variables. The researcher carried out a secondary data analysis using an existing national database which collects information primarily for postsecondary financial aid research. The proposed research questions did not utilize any additional variables from other

databases. The quantitative design allows for a systematic comparison of central tendencies on multiple variables for each respective group. Two distinctly separate multivariate tests, DFA and binary LR, were applied to the same research question and variables in order to characterize each factor's contribution to a predictive model. Although the same variables were maintained for each test, the researcher will compare and contrast the classification results and respective variable relevance characterized within each test. DFA and LR are multivariate statistical procedures which have similar and distinctive uses and assumptions; researchers can use these techniques to predict group membership. Each of these procedures can reveal the importance of individual variables as a set and as individual predictors within a model. However, each analysis has respective strengths and weaknesses which must be taken into account when applied to inferential statistics. A nonparametric test of significance will also address the latter research question.

Discriminant function analysis

Simply put, DFA assigns a score to each case by taking the sum of the discriminant coefficients of each predictor variable and the constant of the model. A defining characteristic of DFA is its treatment of the traditional independent variable as the dependent variable since the discriminant scores composed of the true independent variables will depend on the group membership. For example, a variable like gender would traditionally be treated as an independent variable in other analyses like LR; however, a DFA can predict gender based on other collected data of that case such as test scores, annual income, or stress levels. Since it is the mathematical reverse of multivariate analysis of variance (MANOVA), DFA is sensitive to measures of central tendency. Essentially, group membership will depend on multiple other variables which are significant to the model. Also because of its relationship to MANOVA, a

DFA determines any significant variables using the *F* statistic. Upon a significant *F*, the procedure determines which variables' means differ amongst the groups. Based on the variables which best discriminate between groups, cases are then classified into their respective groups based on their canonical discriminant scores on the single best fitting function for the two group DFA. Cases are classified based on the nearest group centroid or grand mean. The orthogonal functions of DFA explain less variance than the previous function.

DFA answers research questions which focus on the separateness of groups based on several variables. By testing variables related to the construct of the group, a DFA identifies key differences between groups. Researchers who question whether or not certain variables can predict group membership can use DFA to develop a model which classifies cases at a better rate than chance alone. Also similar to MANOVA, DFA traditionally uses continuous variables as the independent or predictor variables; however, researchers typically dummy code categorical variables in order to offer a base or reference group for perspective purposes.

In terms of sample size, there should be the minimum number of cases which sufficiently correspond to the number of continuous variables used in the analysis. Still, cautious statistical analysis submits to power analysis in order to determine sample size or power. The data for the variables must be multivariate normally distributed. Like MANOVA and because DFA is sensitive to measures of central tendency, violations of the multivariate normal distribution are acceptable as long as the distribution is skewed rather than subject to outliers of the univariate and multivariate distribution. Since each of the predictor variables must have an equal chance of contributing to the function at the inception, DFA is sensitive to violations of homoscedasticity of the variance-covariance matrices. In order to obtain an effective discriminant function, the variables used to predict group membership cannot be correlated with each other and none of the

variables can be a sum or function of the others. Each variable must be independent of each other so the analysis will be able to distinguish the relative importance of each predictor. As of late, many researchers tend to use LR over DFA because it is not as rigid in its assumptions.

Logistic regression

Whereas the goal of DFA was to create a linear combination of independent variables to maximize group differences, LR aims to create a linear combination of the log of the odds of being in a certain group (Tabachnick & Fidell, 1996). Similar to DFA, LR can be used to demonstrate the probability or odds of group membership, but it can also be used to show the strength of association between variables in relation to the dependent variable. Binary LR addresses research questions which focus on the odds or likelihood of something occurring based on a set of circumstances.

In order to create the best-fitting model using all of the significant independent variables, the variables can be entered all at once in an exploratory fashion or one at a time using a stepwise method. A stepwise method of variable entry requires some theoretical underpinning in order to justify the influence of analysis in such a purposeful way (Dattalo, 1994). Interpreting the results of a binary LR model requires an interpretation of the Nagelkerke R^2 and the Hosmer-Lemeshow goodness of fit which both assess the difference and acceptability of the present model and the perfect model. The model provides an interpretation of each of the independent variables including different levels of any categorical variables used. Similar to the t-test, the Wald statistic in LR tests the variables' odds ratio in the population. More useful, the expβ describes the relationship of the independent variable to the dependent variable by indicating a positive or negative direction. More importantly, this type of regression analysis allows for the use of both categorical and continuous independent variables. This opens up LR to many more

research questions for which DFA cannot address especially considering LR does not assume a multivariate normal distribution. According to Peng, Lee, and Ingersoll (2002), the main assumption that the binomial distribution is the same as the distribution of the dichotomous outcome can be robust as long as the sample was randomly selected, and cases are independent of each other.

While LR is favored by many researchers because of its ease in interpretation and more flexible assumptions, some disadvantages exist. One of the major drawbacks to LR is its need for very large sample sizes in order to increase the number of observations needed for maximum likelihood estimation. Also, larger disproportions among the groups demand more cases in both groups. In order for LR to provide the most accurate model, all relevant variables should be included and all irrelevant variables should be excluded from analysis; irrelevant variables in LR can increase the rate of misclassification. Also, excluding relevant variables in a LR model can incorrectly attribute variance to the other variables actually included.

Comparing DFA and LR

The scientific community argues the superiority of one over the other based on the characteristics of the sample and the variables in question. According to Press and Wilson (1978), LR does tend to outperform DFA in cases of non-normal distributions; however, LR and DFA will likely give similar classification results unless there are a large proportion of outliers within the data set. This would unfairly affect the function's ability to correctly classify cases since DFA is very sensitive to violations of central tendency. According to Spicer (2005), "discriminant coefficients are less informative than those in regression, whatever their form" (pp. 141).

Still, it can be useful to compare the classification and predictive power of both tests since their aims are so similar. Dattalo (1994) used both DFA and LR to evaluate the utility of the respective models in distinguishing agency-based clinical social workers from private-practice based clinical social workers. LR provided the more parsimonious model for classification; however, parsimony does not guarantee specificity or comprehensiveness. Not only did the LR model provide less significant variables to consider in the model, but the ranking order for the variables by the LR significantly differed from the order of importance presented by DFA. The author interprets only a handful of the 17 discriminant function coefficients when comparing them to the variables presented by LR. In line with Spicer's finding (2005), Dattalo found the underlying structure of the DFA more difficult to interpret. Likewise, the classification results of the DFA and the LR were similar to Press and Wilson's (1978) assertions; the DFA classified 84.3% of the data correctly versus LR which classified 83.28% of the data.

This study will also compare the respective significance of the variables as well as the classification results of each function so that more can be learned about the factors on which student veterans with disabilities may differ from student veterans who do not report having a disability. Given the extensive data available and types of variables available through the National Postsecondary Student Aid Survey (NPSAS), it is acceptable to apply both techniques in order to test different variables for their discriminatory influence over the dependent variable.

Population and Sampling Procedures

Rather than attempting to collect the disability and enrollment records for a national sample of veterans in postsecondary education, a secondary data analysis will utilize the existing data on this population collected by the National Center on Education Statistics. Although actual military veterans only composed 3.1 percent of the sample, the entire dataset represents over

100,000 cases; this leaves a considerable number of cases for subpopulation analyses. All those who identified themselves as not veterans in NPSAS item VETERAN will be excluded from any analysis. Student veterans with disabilities will be compared to student veterans without any reported disabilities on several factors since these two groups are often identified as one in the same in the literature. Approximately 20% of all the student veterans within the sample identified themselves as having a disability. Based on the sampling methods performed by the NCES and described later, it is reasonable to assume this is a nationally representative sample of student veterans in postsecondary education.

Because they are such a niche group, other studies have used secondary analysis to parcel out certain veterans. Smith-Osborne (2009) performed a secondary data analysis on the National Survey of Veterans (NSV) using a regression analysis. The 2001 NSV originally contained over 20,000 cases; however, Smith-Osborne extracted only those Gulf War veterans who were applicable to her research question leaving her with a final sample size of 208. A power analysis supported this sample size. The author maintained the study's variables as they were used in the original NSV. While this study did not use LR or DFA specifically, it did use a multivariate regression analysis on a small proportion of cases from a data set which was collected and maintained by a federal entity. Similarly, the NPSAS contains a large amount of data with hundreds of potential variables such as disability types, marital status, etc. Contract and external researchers have used the dataset to analyze subpopulations like student veterans. Discussed previously, Mamiseishvilli and Koch's study (2011) also used the NCES BPSLS which is a derivative of the NPSAS.

National postsecondary student aid survey

First conducted during the 1986-1987 school years, the NPSAS is a very large data set based on student-level records, on financial aid provided by the federal government, the states, postsecondary institutions, employers, and private agencies, along with student demographic and enrollment data. The full-scale data set from the 2007-2008 survey administration years involves a national sampling frame and picks up from the last survey administration years in 2003-2004. As one of many NCES databases, the NPSAS' main objective is to "produce reliable national estimates of characteristics related to financial aid for postsecondary students at both the undergraduate and graduate levels" (Cominole, Riccobono, Siegel, & Caves, 2010).

Because this is a secondary data analysis, it is important to discuss the methods in which the original data collectors used to gather their data. For the 2007-2008 NPSAS, the target population consisted of all postsecondary students enrolled at eligible postsecondary institutions in credit-bearing courses or vocational courses requiring over 300 hours of instruction (Cominole, et al., 2010). Postsecondary institutions were selected from a sampling frame based on the 2004 Integrated Postsecondary Education Data System. Institutions were stratified prior to selection based on several factors such as public versus private, two versus four year, etc. Eligible institutions submitted enrollment rosters for the school year from which students were selected based on equal probability stratified systematic sampling.

All postsecondary institutions which received Title IV funds were eligible to participate in the study; students attending a Title IV eligible school could participate in the study as long as they weren't concurrently enrolled in high school or primarily completing a high school equivalency certificate. The study used two primary sources for data collection: student interviews and institutional records. Participating institutions either submitted records themselves

through a computer-assisted data entry program or they allowed a trained collector access to their records. Researchers completed student interviews through an initial web-based administration or subsequent telephone interviews; to increase response rates, respondents received up to $30 for completing either administration. The final data analysis files contain data for 127,700 respondents and over 600 constructed variables.

The original study was designed to answer two research questions: How do students and their families finance postsecondary education, and who applies for and who receives aid? (Cominole, et al., 2010). This dataset has served as the basis for countless other statistical reports by the Department of Education and private organizations such as the American Council on Education. Also, the data serve as baseline data for the subsequent longitudinal studies conducted by NCES, Beginning Postsecondary Students Longitudinal Study and the Baccalaureate and Beyond Longitudinal Study.

This database is available publicly through the NCES' Data Analysis System which provides aggregate figures based on selected variables. The restricted research files are available through a guarded process and navigated through an electronic code book. A VCU faculty member sponsored this researcher's access to the data.

Definition of Variables

In order to construct the new data set from the larger NPSAS, the researcher will filter out all cases where students indicated they were not veterans in the VETERAN variable (VETERAN = 0). The selection and retention of variables in this study were based on previous literature indicating the key factors on which student veterans differ from their other nonmilitary counterparts. Because of the inherent limitations of secondary data analysis, the available factors are limited by those within the database. The included variables serve as possible predictors of

disability status amongst all student veterans (see Table 1). Factors often associated with independent students, such as number of dependents and employment status, were also considered for inclusion.

For the primary research question, disability status serves as the grouping or independent variable. Student veterans will be classified as having a disability if their record indicates such. Cases missing this value will be excluded from analysis since a series of artificially imputed values may skew the discriminatory function and regression model. The predictor variables used for the first research question will be applied to both a DFA and LR and are described in Table 1 (see below).

Table 1.

Variables in Research Question 1

IV/DV	NPSAS Name	Label	Type	Response Categories
DV	DISABLE*	Disability Status	Dichotomous	Does not have a disability Has a disability
IV 1	AGEPSE	Age	Continuous	
IV 2	GENDER	Gender	Dichotomous	Male Female
IV 3	DISTALL	Distance learner	Dichotomous	Entire program was DL Program was not DL
IV 4	UGDEG	Degree program type	Categorical	Certificate Associate's Bachelor's
IV 5	GPA	Grade Point Average (GPA)	Continuous	
IV 6	MAJORS12**	Major	Categorical	Undeclared/none Social/behavioral sciences STEM Education Business Health Vocational/technical
IV 7	RISKINDX	Index of Risk Factors	Ordinal	0-7

** Dependent/Grouping variable*
***Original NPSAS response categories collapsed and recoded for analysis*

Of the seven predictor variables included in the analysis, only one variable will be restructured from the original dataset. For practicality of analysis and utility of results, the program majors variable will be recoded from 12 categories to seven categories (see Figure 2).

Other than those who skipped this item, no responses will be excluded in the new response categories.

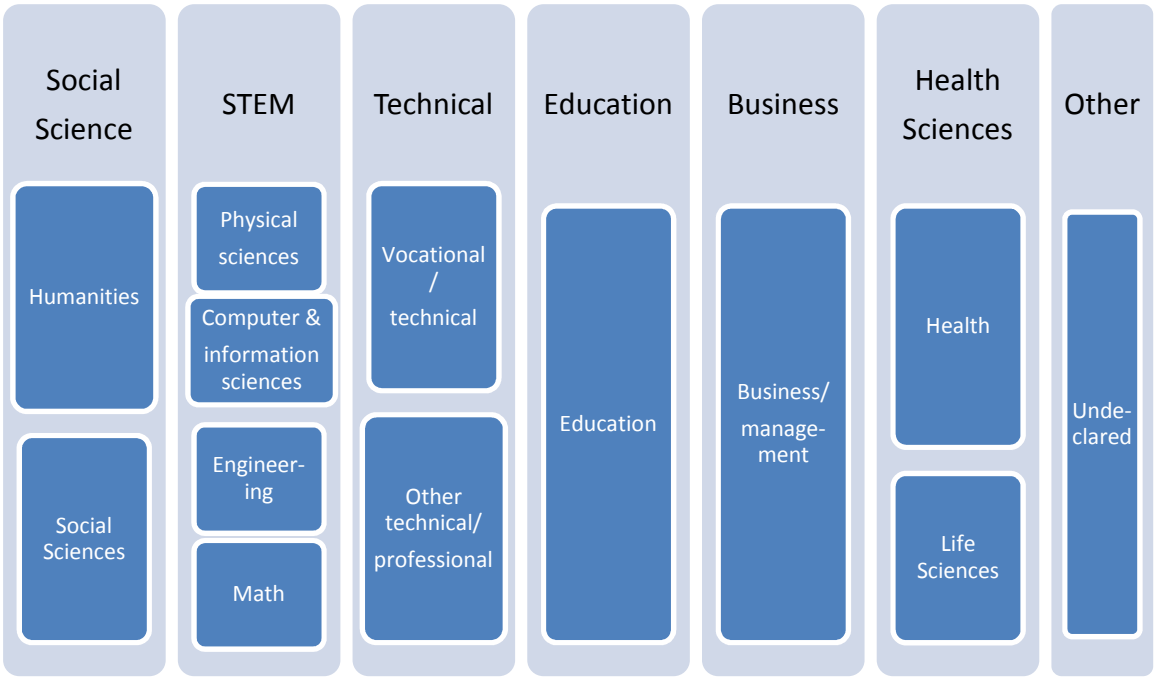

Figure 2. NPSAS 12 major variable recoded

This analysis will also include a variable unique to this particular database and the NCES, RISKINDX. The risk index of a student represents a respondents summed risk factors ranging from an assigned score of zero through the number of maximum risk factors, seven (see Figure 3). Each respondent gets one risk point for each factor determined by NPSAS. A student gets one risk point for every time they answer positively to seven different questions in the survey which target whether or not they had delayed postsecondary enrollment, whether they lacked a high school diploma, whether they were only enrolled part-time, whether they were financially independent, whether they had dependents in their care, whether they were single parents, or whether they worked full-time. Of course, these items reflect other important life responsibilities which may distract from their roles as college students. In order to avoid issues with data

collinearity, none of these items were chosen for the analysis since RISKINDX is a function of these seven other variables.

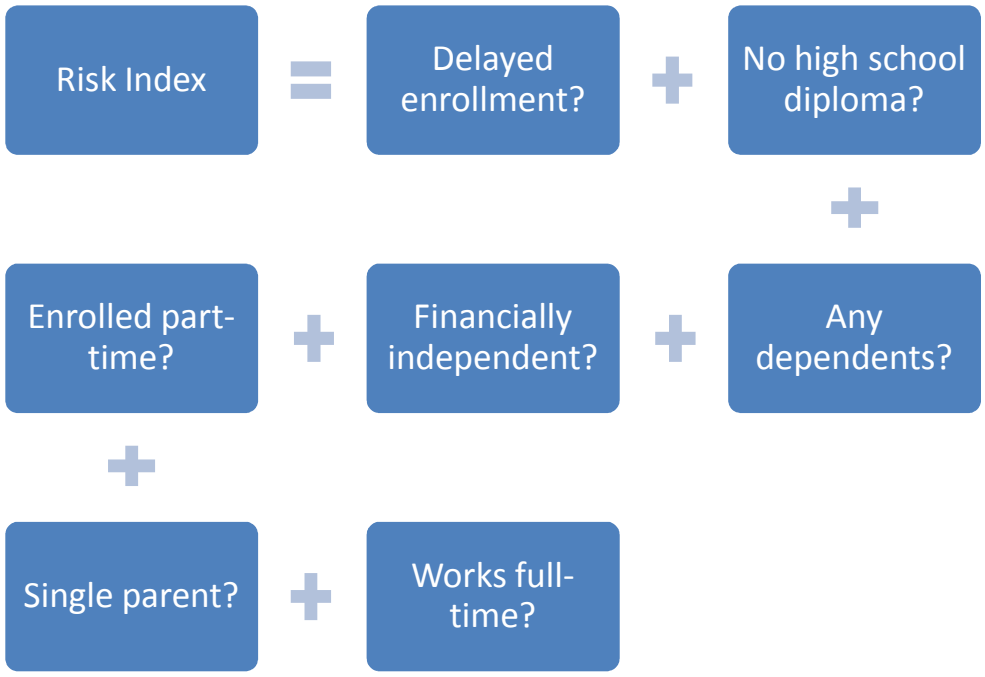

Figure 3. Calculating a student's risk index

These variables were chosen based on the past research on student veterans which analyzed this population as an entire group without disaggregating those with disabilities. Acquired disabilities especially have life altering impact which may alter an individual or a group's traditional life plan or trajectory, especially in college. For those who do choose to disclose or self-report their disabilities, it would be a grave disservice to them to classify them incorrectly based on several enrollment and demographic factors. This type of information is often used by higher education administrators to make policy decisions or build programs; consequently, more specificity of knowledge in regards to student veterans with and without disabilities only aids both students and the institutions to make college campuses even more veteran-friendly.

Radford (2011) specifically discusses the enrolment and demographic differences between student veterans and their traditional undergraduate and independent undergraduate peers. While student veterans significantly differed from their non veteran peers on several factors such as major, age, and type of educational program, the relationship between these particular variables and disability within the student veteran population had yet to be tested. This study's findings both warrant and challenge the treatment of student veterans with and without disabilities as the one large, identical group they have been referred to in the literature. Applying these variables to inferential tests of significance impacts the literature by studying those student veterans with disabilities specifically rather than acknowledging their presence only.

Data Analysis

Chi-squared analysis, DFA, and binary LR will be utilized for this investigation. Each student veterans' case will be weighted according to the corresponding weight variable provided by NPSAS. Prior to chi-squared, DFA, and LR, descriptive statistics will be conducted in order to characterize the subpopulation under study. IBM SPSS version 19.0 will be used to conduct all analyses of the data. G-Power will be used to conduct a post hoc power analysis since the sample size appears sufficient for both the LR and DFA at about 3000 cases.

The primary research question will be addressed using two different statistical procedures, DFA and LR. Each test will highlight the differences in group membership amongst student veterans with disabilities and student veterans without disabilities. This investigation aims to use both DFA and LR in order to distinguish between student veterans with disabilities and student veterans without reported disabilities based on seven different predictor variables. Although only two of the seven predictor variables are continuous in nature, all categorical variables will be dummy-coded in the DFA.

Prior to conducting these multivariate statistical analyses, univariate tests of significance will be conducted between each predictor variable and disability status in order to characterize any relationships existing without the influence of other the factors. Pearson's X^2 analysis will test whether choices in education program types such as distance learning versus bricks and mortar campuses are independent of a student's disability status. This tests the hypothesis that a student with a disability may or may not be drawn to the conveniences of a home-based education program. All analyses will include a discussion on the tenability of assumptions for each respective multivariate procedure. To characterize the relationship between disability status and age as well as disability status and risk index, independent samples t-tests will be performed. To characterize the relationship between disability status and all other categorical variables such as gender, distance learning, etc. separate Pearson's X^2 tests will be performed.

Delimitations

The findings from this investigation only represent student veterans enrolled at American postsecondary institutions receiving federal funds. The data only characterize those student veterans who disclosed themselves as such and who disclosed their disability status in 2007-2008 academic years. This data cannot represent those veterans who were not counted as such by NPSAS or those with disabilities who chose not to disclose them to NPSAS or their institutions. Also, this data cannot represent those veterans pursuing education courses not deemed eligible by NPSAS.

Institutional Review Board (IRB)

This researcher will submit an exempt application for IRB approval only if deemed needed by the School of Education administration and dissertation committee. This research is a secondary data analysis of a national database containing individual records that this researcher

cannot tie back to any individual. While each case does contain a generic identifier, there is no way for this researcher to obtain the actual identities of these individuals using that identifier in the database. Variables such as name, address, phone number, social security number, etc. are not contained within the NPSAS database being used in this research.

CHAPTER 4

RESULTS

This study examined whether several factors – age, gender, campus type, degree program type, grade point average, major, and number of risk factors – possibly indicated whether or not a student veteran had a disability or the odds of having a disability versus not having a disability. The purpose of this investigation was to identify the systematic differences amongst student veterans who have a disability and those who do not; this investigation also aims to compare the classification rates and utility of two multivariate procedures: discriminant function analysis and logistic regression. Given the characteristics of the predictor variables and the two-group dependent variable, a LR and DFA has the ability of predicting the odds of a student having a disability versus not having a disability and identifying the relationships which most significantly differentiate the two groups (Dattalo, 1994).

This chapter is divided into four parts: the first section contains a description of the entire sample, especially the characteristics on the variables in the multivariate equations; the second section analyzes the univariate differences between those student veterans with and without disabilities; the next section evaluates the results from a DFA and LR; and the final section compares each multivariate model and their tenability of assumptions.

From the full 07-08 NPSAS, only those who indicated they were veterans in the item VETERAN were selected for analysis (N=3832); all other cases where VETERAN = 0 were filtered out of the working data set. The working data set only contains student veterans enrolled in postsecondary education who responded to the 07-08 NPSAS. Veterans will be divided into those who indicated they had a disability on the item DISABLE and those who indicated they did not have a disability. All missing values for the DISABLE item were excluded from analysis since this variable will be used as the dependent in all subsequent research questions. All non-

predictor variables were also removed from the working data set in order to allow for easier accessibility of the relevant variables.

Descriptive Statistics

The final working data set contained 599 cases of veterans with disabilities and 3233 cases of veterans without disabilities (*N*=3832). Of those with disabilities, student veterans reported orthopedic or mobility impairments most often (see Table 2). While "other" disabilities were second most frequent response, the data indicates mental/emotional/psychiatric conditions as the third most frequent disability. None of the 599 cases reported a developmental disability as a primary condition. While almost 85% of the veterans pool reported having no disability, 17.5% of those veterans with disabilities (*n*=105) reported having two or more conditions that were some combination of a mobility, sensory, or other impairment.

Table 2.

Student Veterans' Disability Types (*n*=599)

Disability Type	Frequency	Percent
Orthopedic/Mobility impairment	147	24.5
Other	100	16.7
Mental, emotional, psychiatric condition	72	12.0
Depression	69	11.5
Hearing Impairment	55	9.2
Attention deficit disorder	54	9.0
Health impairment or problem	36	6.0
Dyslexia/Specific learning disability	34	5.7
Brain injury	18	3.0
Blindness/Visual impairment	11	1.8
Speech/Language impairment	3	0.5
Total	599	99.9

The average age of the entire sample of student veterans was 24.4 years old after cleaning the data of missing values and those cases which were under 18 years old. Approximately 39 or 1%

of the veterans indicated their age as 17 or younger. Since this is a secondary data set and military service requires individuals to be at least 18 years old, it is unclear whether these supposed minors are verified or a result of misreporting. Likewise, the maximum age reported amongst veterans was 73 years of age; only 1% of respondents reported they were 51 years or older. According to the technical report of the full data set, if administrators did not confirm veteran status via financial aid application, student interview, or institutional records, all students younger than 19 were listed as non-veterans (VETERAN = 0).

Males composed the majority of the veterans (*n*=2724) while females composed 29% of the sample. Student veterans as a whole were most often enrolled in Bachelor's degree programs, but a third of veterans enrolled in associate's degree programs (see Figure 4). In terms of program type, more than 30% of the veterans indicated the educational programs in which they were enrolled were entirely through distance learning.

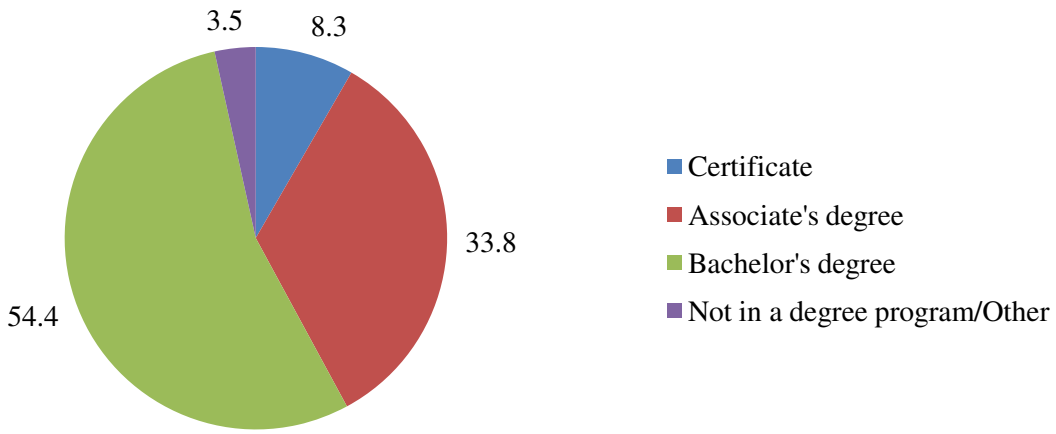

Figure 4. *Percentage of Student Veterans' Degree Programs*

The majority of student veterans (54.4%) enrolled in bachelor's degree programs whereas 34% enrolled in associate's degree programs; veterans enrolled in certificate programs comprised less than 9% of the sample while 3.5% of respondents claimed they were not in a

degree program or a program "other" than bachelor's degree, associate's degree, or a certificate. Student veterans' GPA ranged from 0.00 to 4.00 (M = 3.14, $SD.$ =0.73); so that 0.00 is not confused with a missing value, all missing values in this dataset were labeled "-3" and excluded from any analyses. The presence of missing values is discussed later in prescreening as it pertains to inferential statistics. NPSAS administrators organized major program for all those students enrolled in any degree program (UGDEG < 4). The variable used to interpret undergraduate majors, MAJORS12, was recoded from 12 categories to seven for parsimony (see Figure 2). After recoding the variables, all veterans in analysis were most frequently STEM majors (21.9%) (see Figure 5). Before recoding and combining physical sciences, math, computer/information sciences, and engineering into the single STEM category, business/management was the most popular major (19.5%) among student veterans.

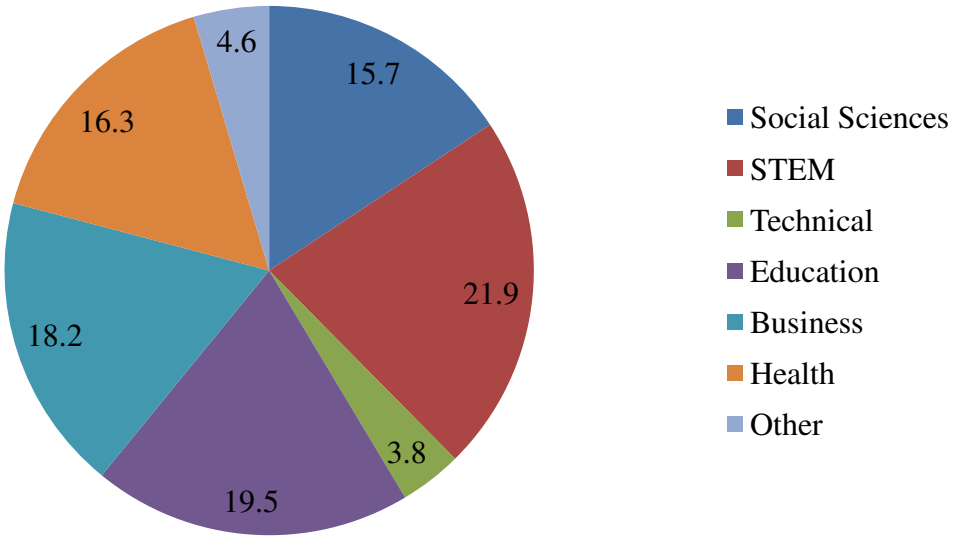

Figure 5. *Percentage of Veterans within Each Major*

When analyzing the entire sample's risk index, it is understandable that veterans would have at least one risk factor given their financially independent status by default. Only 7% of the student veterans had the single, default risk factor; on the other hand, only about 5% of student

veterans had six or more risk factors (see Figure 6). Approximately one-third of the sample fell in the mid-range with 3-5 risk factors. The distribution of risk factors of student veterans was almost bimodal if not normal: most student veterans had three to four risk factors.

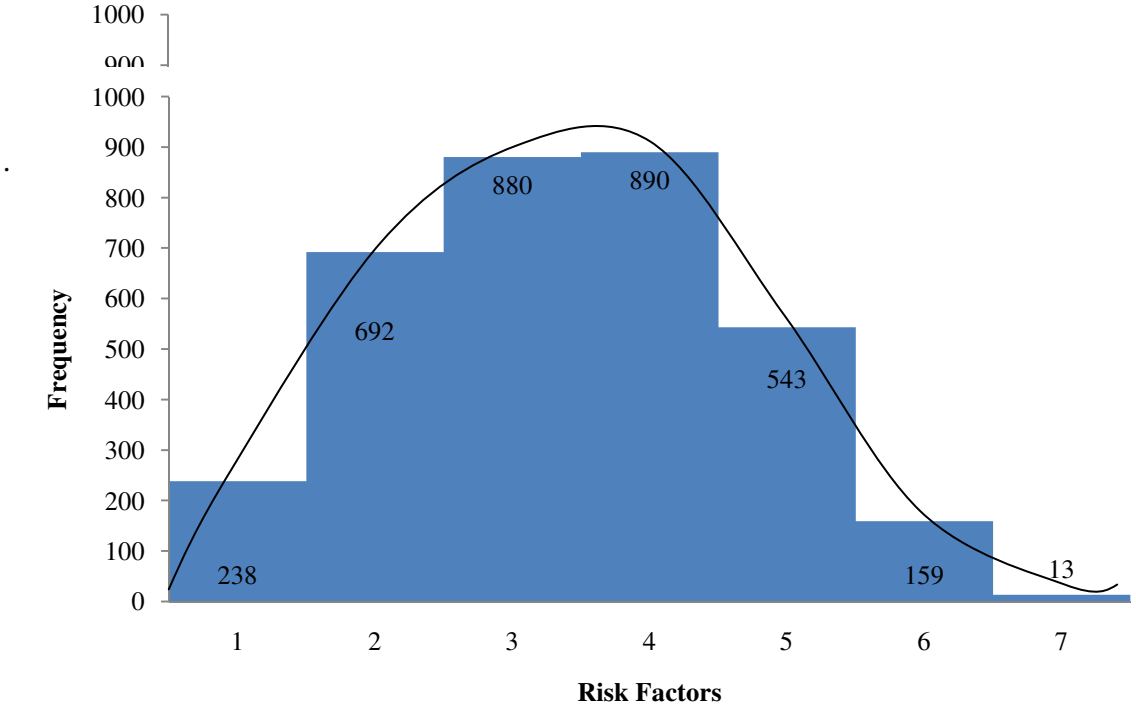

Figure 6. Student Veterans' Number of Risk Factors

Inferential Statistics

Prescreening data for assumptions

The secondary data, which was gained through NPSAS and filtered from all non-veterans, went through a thorough prescreening process for missingness, multivariate outliers, multivariate normality, and homoscedasticity. These four prescreens were chosen because of their importance in the multivariate assumptions discussed later. All Pearson's correlations on the dependent variable, disability status, equaled one indicating a constant on this variable across the independent variables. None of the missing values on the predictor variables correlated with the dependent variable, disability status; therefore, the data was missing at random. Although the

data set was not complete on variables such as distance learning, there is no reason to believe that these missing values related to a student's disability status.

The full NPSAS calculated almost 80% missing for DISTALL variable; the subsample of student veterans in this analysis was missing almost 70% of cases. The reason for this high rate of missing values on this item is because DISTALL was collected after a student had previously responded in a previous item that they had or had not taken any distance education courses in 2007-2008. If a student had responded that they had not taken any distance courses, the item was skipped, and the skipped option was calculated in the DISTALL analysis. If the student had responded that they had taken distance courses, they were asked if their entire program was or was not through distance learning (Powerstats, 2011). Likewise, if a veteran had responded that they were not taking any distance learning courses, they would have automatically skipped the DISTALL item. Using the same 2007-2008 NPSAS dataset, a confirmatory check of the NCES analysis program, Powerstats, indicated no significant relationship of student veterans with and without disabilities who took any distance education courses.

In order to determine the presence of outliers within the sample, Cook's *D* values were calculated using a linear regression procedure. For the sample (*N*=3481), 42 cases exceeded the criterion of .00115 which was calculated using the average of a criterion 4/n (Datallo, in press). Using the Cook's *D* (Datallo, in press) greater than 1 criterion, no serious outliers existed within the data set. Less than 2% of the total sample fell outside of the more serious criterion of .00115 and no cases fell outside the criterion of 1. Furthermore, no cases exceeded the average of these two criterions, which was .50057. Subsequently, multivariate and univariate procedures will maintain these cases. A more serious consequence of deleting these data would be eliminating cases of veterans with disabilities which is already a much smaller group than the student

veterans without disabilities. Veterans with disabilities composed all cases where Cook's *d* exceeded the outlier criterion.

The distribution is positively skewed; therefore, the outliers contribute to violations of multivariate normality. The data met assumptions of homoscedasticity indicating that the predicted values of the disability scores had approximately the same residual variance. A logarithmic or square root transformation of the outlying data may reduce the effect of non-normality; however, these transformations potentially compromise unique representativeness of these cases (Osborne, 2002). By promoting normality amongst the distribution, the data set also inherits many more assumptions and threats (Osborne, 2002). To reiterate, the outlying cases under consideration are the very cases that this research is particularly interested in comparing to the larger, more mainstream group, those student veterans without disabilities.

Rebasing weights to subpopulation

In order to examine the relationships amongst each of the student characteristic variables and disability status, univariate tests of significance were conducted prior to multivariate tests using the calculated weight for each individual case. All inferential tests used the NPSAS weight variable WTA000 to calculate new weights, WTV, for the subpopulation of student veterans (see Figure 7). WTA000 corrects for sampling error and non response bias for the entire population of undergraduates rather than just student veterans; this final study weight was used to reconfigure a weight for the subpopulation of student veterans only. Weights calculated from exponentially larger population projections can lead to biased inferential statistics when applied to smaller subsets of the sample (University of British Columbia, n.d.). Rebasing the weight for the subpopulation of student veterans allows for more authentic generalizeability to a national

sample of undergraduate student veterans without artificially multiplying the frequencies of student veterans to the point of a possible Type 1 error.

$$\text{WTV} = \text{WTA000 x } \left(\frac{3832}{201{,}441}\right)$$

Figure 7. Student Veterans' Rebased Weight Formula

The rebased weight for each case is a product of the final study weight (WTA000) which was calculated by NPSAS and the dividend of the total sample size, 3832, and the population of undergraduate student veterans in the U.S. This last value, total number of student veterans in the population, was taken from the 2000 U.S. Census Bureau's total undergraduates; recent NCES literature (Radford, 2011) calculated that student veterans composed 3.1% of total undergraduates in the U.S. or 201,441 student veterans. The new rebased weight allowed the data to maintain the population proportions indicated in the total sampling weight for the full survey without over inflating the frequencies (see Table 3). However, WTV also considerably reduced the range (.00 – 108.91) and mean (M=3.79, $S.D.$=4.98) when compared to the range (.22 – 5725.23) and mean of the weights provided for the full survey sample (M=199.45, $S.D.$=261.66).

Table 3.

Frequency Distribution of Veterans' Disability Status by Weight

Veterans' Disability Status	Weighted (WTA000)	Rebased weight (WTV)	Unweighted
With Disabilities			
Frequency	115784	2203	599
Percentage	15.1%	15.1%	15.6%
Without Disabilities			
Frequency	648510	12337	3233
Percentage	84.9%	84.9%	84.4%
Total Frequency	764293	14539	3832

Univariate Tests of Significance

Prior to examining the multivariate relationships of the students' characteristics and disability status, seven univariate tests characterize the univariate relationships which may exist (see Table 5).

1. When comparing age, although veterans with disabilities were slightly older (m=24.25, $s.d.$=7.50) than veterans without disabilities (m=23.26, $s.d.$=7.00), there was no significant difference in age; $t(12360)= -1.85$, $p=.065$.
2. When comparing gender, female veterans were less likely to report a disability than male veterans; X^2 (1, N = 14,539) = 51.18, $p<.001$. Females composed only a marginal portion of the total sample of student veterans; however, male veterans composed a significantly larger proportion of those student veterans with disclosed disabilities.
3. The proportion of those students enrolled in distance learning programs did not differ significantly based on disability status; X^2 (1, N = 4363) = .494, p=.482. For this particular variable, if a veteran had responded that they were not taking any distance learning courses, they would have automatically skipped the DISTALL item. Still, a secondary check of the NCES analysis program Powerstats indicated no significant relationship of student veterans who took any distance education courses in 2007-2008 using the same NPSAS dataset.
4. The type of degree student veterans sought related to their disability status, X^2 (3, N = 14,539) = 32.71, $p<.001$. Those student veterans with disabilities were more likely to enroll in associate's degrees programs, but both veterans with and without disabilities enrolled in bachelor's degree programs at about the same rate. Student veterans with

disabilities enrolled in certificate and non-degree programs less often than their peers without disabilities.

5. When comparing GPA, student veterans with disabilities had a significantly lower mean (m=2.92, $s.d.$=0.81) than student veterans without disabilities (m=3.01, $s.d.$=0.82); t(12504)= 4.62, p<.001, d=.083. Both student veterans with and without disabilities averaged a B by the standard academic letter grades; however, student veterans with disabilities averaged almost a tenth of a point less than their peers.
6. Student veterans with disabilities were more likely to major in the social sciences or business when compared to student veterans without disabilities. Those with disabilities tended to major in the STEM fields or education less often than their peers without disabilites; X^2 (6, N = 11,769) = 28.64, p<.001. For technical majors, enrollment was almost identical for both groups.
7. The median risk index for student veterans with disabilities was actually lower than those student veterans without disabilities; X^2 (1, N = 12,503) = 25.44, p<.001. Despite having disclosed a disability, those veterans with disabilities were actually assigned lower mean scores than those without disabilities.

With the exception of age and distance learning status, those with disabilities significantly differed from their peers on five of the seven factors. In order to infer to the population of undergraduate student veterans in the U.S., weights for student veterans in the sample were calculated from the final study weight and applied during all inferential statistics procedures. The significance of these relationships may change the ability to distinguish veterans with and without disabilities when other factors are taken into consideration within the same analysis. In order to avoid attributing variance to irrelevant constructs, age and distance learning will be

excluded from multivariate analysis. Dattalo (in press) suggests that maintaining a multivariate model with irrelevant predictors can complicate the results and structure.

Table 4.

Summary of Univariate Tests

Variable	**Statistic**	**Significant?**
Age	$t(12360)= -1.85, p=.065$	No
Gender	X^2 (1, N = 14,539) = 51.18	Yes
Distance learner	X^2 (1, N = 4363) = .494	No
Degree program type	X^2 (3, N = 14,539) = 32.71	Yes
GPA	$t(12504)= 4.62, p<.001, d=.083$	Yes
Major	X^2 (6, N = 11,769) = 28.64	Yes
Index of Risk Factors	X^2 (1, N = 12,503) = 25.44	Yes

A closer look at a correlation matrix of the variables in the equation helps to broaden the understanding of the variables' relationships with each other across the entire sample (see Table 5).Given the large sample sizes from the weights applied, most variables had significant correlations at the $\alpha = .01$ level, but Pearson's r did not exceed .50 for any of the relationships between the independent variables. Instead, only risk index (RISKINDX) and age during postsecondary enrollment (ABEPSE) had the highest correlation at $r=.244$. Even with a moderately low Pearson's correlation, the composite variables which make up risk index would

be more likely in an older student such as one who had dependents, worked in order to support those dependents, was only enrolled part-time in a program, delayed their postsecondary entry because of the military or family obligations, etc. While there was no colinearity amongst the independent variables on disability status in the prescreening stage, the correlation of the variables further justifies the independence of relationships within the model.

Table 5.

Correlation Matrix of Predictor Variables

Correlations

		AGEPSE	GENDER	RISKINDX	DISTALL	GPA	MAJOR	DEGREE
AGEPSE	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	12362						
GENDER	Pearson Correlation	-.039**	1					
	Sig. (2-tailed)	.000						
	N	12362	14539					
RISKINDX	Pearson Correlation	.244**	.049**	1				
	Sig. (2-tailed)	.000	.000					
	N	12362	12506	12506				
DISTALL	Pearson Correlation	.082**	-.008	-.012	1			
	Sig. (2-tailed)	.000	.612	.478				
	N	3587	4363	3625	4363			
GPA	Pearson Correlation	.040**	-.003	.031**	.027	1		
	Sig. (2-tailed)	.000	.763	.000	.109			
	N	12362	12506	12506	3625	12506		
MAJOR	Pearson Correlation	.033**	.056**	.049**	.050**	-.003	1	
	Sig. (2-tailed)	.000	.000	.000	.003	.713		
	N	11641	11770	11770	3513	11770	11770	
DEGREE	Pearson Correlation	-.013	-.023**	-.049**	.128**	.062**	-.162**	1
	Sig. (2-tailed)	.163	.009	.000	.000	.000	.000	
	N	12362	12506	12506	3625	12506	11770	12506

**. Correlation is significant at the 0.01 level (2-tailed).

Multivariate Tests

Discriminant function analysis

A DFA was conducted to predict whether or not a student veteran had a disability based on the predictor variables of age, gender, distance or campus learning, type of degree program, GPA, major, and risk index. The log determinants for the two-group DFA were quite similar and shared an acceptable rank of seven for both groups. Still, the model's significant Box's *M* of 224.47 ($p<.001$) violated the equality of variance-covariance assumption. Because of the larger sample size and DFA's sensitivity to non-normality, a significant Box's *M* should be noted, but DFA has proven robust to this type of violation; Box's $M = 224.47$, $F(28, 2959801)=7.98$, $p<.001$ (Datallo, in press; Burns & Burns, 2008).

A closer look at the correlation matrix confirms violations of variance-covariance matrices. For both groups of student veterans, GPA tended to covary with AGE, but disability tended to have an opposite effect for both groups. The relationship between GPA and most of the variables tended to be significant with the exception of distance education for those without disabilities and gender for those with disabilities. GPA proved to be one of the weakest predictor variables in the function; likewise, major and risk index proved to have similar relationships across variables and groups (see Tables 6 & 7).

Table 6.

DFA Covariance Matrices

DISABLE		AGEPSE	GENDER	RISKINDX	DISTALL	GPA	DEGREE	MAJOR
No disabilities	AGEPSE	52.295						
	GENDER	.128	.210					
	RISKINDX	2.108	-.011	1.509				
	DISTALL	.245	.001	-.026	.215			
	GPA	-14.090	-2.736	2.108	-.268	6468.508		
	UGDEG	-.551	-.009	-.076	.043	4.529	.312	
	MAJOR	.251	.026	.054	.008	-8.541	-.168	3.690
W/ Disabilities	AGEPSE	47.896						
	GENDER	-.618	.203					
	RISKINDX	1.112	.077	1.557				
	DISTALL	.443	.043	.049	.208			
	GPA	16.748	-.171	11.133	6.921	4782.457		
	UGDEG	.393	.029	-.053	.027	.945	.280	
	MAJOR	.859	-.009	-.259	.222	-3.213	.020	3.949

Although the matrix was solvable and the function was statistically significant, it yielded only low explanatory power with a canonical correlation of only 12%. Closer analysis of both structure coefficients and discriminant scores (see Table 7) indicate that a student veterans' choice in major and their risk index are the most significant factors setting them apart from their peers based on disability status. Gender was the weakest predictor in disability status indicating a minimal relationship between a student's gender and whether or not they have a disability. Overall, the function classified about 59% of the cases correctly which is slightly better than the classifying student veterans' disability status on chance alone; the function classified those with and without disabilities at similar rates, 60% and 57% respectively.

Table 7.

Structure Coefficients and Discriminant Scores of Predictor Variables

Variable	Function 1	
	Structure Coefficients	Discriminant Scores
Age	.176	.044
Gender	.121	.118
Distance learner	.127	.123
Degree program type	.284	.291
GPA	-.121	-.198
Major	-.596	-.579
Index of Risk Factors	.698	.731

Logistic Regression

A binary LR was conducted to predict group membership amongst student veterans with and without disabilities using the same predictor variables as in the DFA procedure outlined above (see Table 5). A Nagelkerke's R^2 of .045 confirmed the current model's statistically difference from the perfect model; $X^2(8, N=1003)=40.97$, $p < .001$. While there was a weaker relationship between prediction and grouping, the model still classified 85% of cases correctly. Table 7 below provides full results for the variable included in the model. Of the predictor variables, the Wald statistics were significant for risk index ($p<.001$), undergraduate degree ($p<.01$), and major ($p<.001$) indicating a stronger relationship with the dependent variable of having a disability (see Table 8). Age, gender, distance learning, and GPA were not significant predictors of disability status. Those student veterans with disabilities had a lower risk index than their peers by a factor of .823. According to the model, student veterans were more likely to have

a disability if they were had a lower risk index, enrolled in bachelor's degree programs, and were not enrolled in a technical vocation or business major.

Table 8.

Odds-ratios for Variables in the Equation [DV = Having a disability (1)]

Variable	Wald	Sig. (*p*)	Exp. *B*	95% Confidence Interval for Exp. *B*	
				Lower	Upper
Age	.045	.833	.998	.985	1.013
Female	1.883	.170	1.162	.938	1.440
Risk Index	22.276	.000	.823	.758	.892
Distance Learning(1)	.199	.656	.951	.765	1.184
GPA	3.408	.065	1.001	1.000	1.002
UGDEG_Certificate	12.277	.002			
UGDEG(1)_Associate's	4.016	.045	.504	.257	.985
UGDEG(2)_Bachelor's	6.009	.014	1.294	1.053	1.590
MAJOR_ Social Sciences	46.496	.000			
STEM	1.503	.220	.784	.531	1.157
Technical	7.158	.007	.561	.368	.857
Education	1.036	.309	.707	.362	1.379
Business	5.043	.025	.635	.427	.944
Health	3.017	.082	1.412	.957	2.084
Other	1.131	.288	1.242	.833	1.850

Comparing the results of DFA & LR

In addition to identifying the factors on which student veterans with disabilities differ from their peers, this study aimed to compare the utility of a multivariate discriminant function and regression model. The models paralleled each other in terms of significant variables and rank order to some extent. Both the DFA and LR recognized risk index and major as the most relevant predictors of disability status; however, the discriminant function placed much less importance on the role of type of degree program students chose. The results for both analyses indicate that

age, GPA, gender, and whether or not a student was a distance learner were not significant predictors of disability status. The results from the univariate tests of significance indicated five of the seven predictor variables as significant, yet the multivariate results only identify two to three reliable predictors. From the multivariate output, the nonsignificant predictor variable of GPA approached significance; notably, this variable was significant in univariate tests. There may still be a relationship between GPA and disability status; however, the inclusion of other variables predictor variables may dampen that relationship.

The data set met the assumptions of logistic regression much more easily than those of DFA. The characteristics of the data set influenced the utility and interpretability of each model based on its separate requirements. Each procedure has its own assumptions; however, DFA and LR share a set of assumptions also. For both procedures, the data set met the criteria of mutually exclusive groups. Student veterans were either classified as having a disability or not and could not be counted amongst both groups. These mutually exclusive groups were naturally occurring and not artificially created. The observations or cases met the random sample requirement given that all cases of student veterans were selected from the NPSAS data set which was also randomly selected from the population. In the case of over sampling and nonresponse bias, inferential analyses applied weights in order to correct for any instances where the sample misrepresented the population proportions.

For DFA, the predictor variables were normally distributed within themselves; however, the assumption of multivariate normality was not met due to several cases of outliers. DFA does tend to be robust to violations of multivariate normality (Miller, 1999). These multivariate outliers had Cook's *D* which exceeded the criterion; however, these cases all came from the same dependent variable group of student veterans with disabilities so they were maintained in

the final analysis. Although there was a serious issue with missingness on the variable of distance learning, no missing values on this or any of the independent variables correlated with the dependent variable of disability status.

Fewer assumptions of normality or linearity exist for LR. Burns & Burns (2008) suggest 50 cases per independent variable; therefore, this data did meet the requirements of maximum likelihood estimation with a sample size greater than 1000 in the final analysis. Testing several categorical and a few continuous predictor variables fit the looser requirements of LR better than they did DFA.

The logistic regression classified about 16% more cases correctly possibly due to the violations in assumptions within the DFA. In both analyses, the models classified more cases of student veterans without disabilities correctly than they did student veterans with disabilities due to the larger number of cases within this group. Also, the cases of outliers were all within the student veterans with disabilities group as well.

More so than DFA, LR provided more specific analyses at the interval level and was helpful in identifying the odds ratio or risk factors for identifying a student veteran as having a disability. Analogous to the basic t-test, the Wald statistic provided a less convoluted way of determining statistical significance and the direction of the relationship given the exp. *B.* In DFA, both the structure coefficients and the standardized coefficients have to be interpreted and compared in order to understand the complexity of the function and relative contribution of each variable.

Calculating power

Using the software package G*Power 3.1, a post hoc power analysis was conducted to assess effects of the sample size on each analysis (Faul, Erdfelder, Lang, & Buchner, 2007).

According to Cohen (1992), power is the long-term probability, given the population effect size, α, and sample size, of rejecting the null hypothesis. For the DFA, a post hoc analysis was conducted using a generic *F* test calling for the noncentrality parameter of the *F*-distribution (λ), the acceptable error probability (α), and the numerator and denominator degrees of freedom. At a λ of 123 and an α set at .05, power exceeded .99 with a critical *F* of 2.10.

In order to assess power in the LR given the parameters of this data set, a post hoc power analysis specifically for logistic regression was also computed using the same software package. After inputting the parameters of the odds-ratio of the constant of the model, α, sample size, R^2, amongst other values provided by the SPSS output, computed power exceeded .99 as well with a ciritical *z* of -1.96.

Each of these tests used a two-tail test in order to retain a more exploratory rather than directional analysis. Both tests yielded high power given the sample size and other test parameters; however, special caution needs to be paid to such high powered results especially given the lower values assigned to the variance based on disability status. Larger sample sizes can distract from low effect sizes such as in the case of the above analyses; caution must follow such overpowered significance (Volk & Quinsey, 2002).

Summary

The results from the descriptive statistics, univariate tests, multivariate tests, and power analysis indicate some differences amongst student veterans with disabilities and their peers without disabilities. Despite five out of seven significant results on univariate tests, only two to three significant predictors remained in the multivariate models. Student veterans with disabilities had a statistically significant lower risk index score and categorically different majors from student veterans without disabilities. Effect sizes remained low despite statistical

significance. The sample of student veterans with disabilities represented every category of disability within the survey, but orthopedic/mobility impairments were most common followed by “other” disabilities. The LR performed better overall in terms of parsimony of variables and interpretation and ability to classify more cases correctly. This may be in part to the nature of the variables and the more flexible assumptions allowed by LR over DFA. Despite the presence of outliers, the multivariate functions performed well considering the nature of the variables and their lack of perceived relevance to the dependent variable. Still, some interesting relationships emerged which characterize student veterans with disabilities as very similar to their peers without disabilities but with a few surprising differences such as their lower perceived risk of attrition from higher education.

CHAPTER 5

DISCUSSION

The research on student veterans lacks specific inquiry into student veterans with disabilities and how their educational experience may differ from their peers given their often times newly acquired, life-altering conditions. Previous research on student veterans in general has characterized this population as similar to nontraditional students in some respects but very dissimilar to the population of undergraduates in general. This study aimed to assess the similarities and dissimilarities of student veterans with disabilities from their student veterans peers since this group is often aggregated in the literature. The presence of disability among student veterans has become a reality for a proportion of those leaving combat and pursuing higher education. This chapter will address findings from the research, the perceived limitations of this particular study, and recommendations for further research.

Findings

This study aimed to compare student veterans with disabilities to student veterans without disabilities since this group is often aggregated in the literature. Because disability is a reality in the world of student veterans, it is important to understand the enrollment and demographic characteristics as closely as possible in order to tailor academic support to their specific needs. Previous literature has focused on the types of disabilities amongst the returning combat veteran population (Tanielan & Jaycox, 2008); however, there has been a lack of specific inquiry into the prevalence and types of disabilities among veterans choosing to return to postsecondary education.

The most common disability reported among student veterans, orthopedic/mobility impairments, aligns with the perception of a student veteran's prior military career as one

requiring a great deal of physical sacrifice. Orthopedic/mobility impairments can include mild SCI to paralysis and even amputation. From the survey design, it is difficult to interpret "other" disabilities since this option served as a catch-all for the 16% of veterans who felt their conditions were not represented within the survey responses. Still, the third most common disability includes within it any diagnosis of PTSD, a signature injury of the OIF/OEF conflicts (Branker, 2009; Shackelford, 2009; Zinger, 2010). Almost 15% of student veterans with disabilities had dyslexia, specific learning disability, or attention deficit disorder, which are all conditions that may have preexisted prior to military service. Survey administrators compiled this particular data from student interviews; consequently, disability support services offices may be unaware of these disabilities which affect classroom learning specifically. While they may decline support services through academic accommodations, these student veterans likely progressed through a military career with these non-apparent disabilties for which they would have to accommodate themselves. Though 24% of student veterans with disabilities self-reported either depression or another mental, emotional, or psychiatric condition, the 15% with other non-apparent, learning-related disabilities match the disability types that disability support service professionals most commonly see in the general undergraduate population (Raue & Lewis, 2011). While the 11% of those who cited depression as a disability may not appear to have combat-related conditions, Tanielian, Jaycox, and Rand (2008) suggest that the battery of conditions related to post combat injury include depression as a mental health condition brought on by experiences during military service.

Only 3% of cases self-reported the other signature injury of the OIF/OEF veterans' population, traumatic brain injury. It is unclear whether this is due to low self-report or incidence of veterans with this type of acquired disability enrolling in postsecondary programs.

Brain injury covers a vast symptomology from mild TBI such as a concussion to more serious injury which can affect speech, balance, and cognitive functioning (DVBIC, 2011). However, those who suffer from mild TBI typically experience a full recovery within one to three months whereas disability as its defined from this survey administration requires a persistent condition for 6 months or more (DVBIC, 2011). In a telephone survey conducted by RAND (2008), 19% of previously deployed veterans "reported a probable TBI" (p. xxi). Even with little to no insight on the severity of TBI within the Tanielian et al. study's respondents, the presence of only 3% of veterans with a TBI indicates that veterans may delay enrollment until TBI symptoms subside or may be staying out of higher education completely. Without further inquiry into this population's career and educational decisions post-injury, higher education administrators must prepare to accommodate more of this specific disability if they are going to appeal to a wider range of veterans who have the means, experience, and maturity to contribute to academia.

What are the best demographic and enrollment status predictors of student veterans with disabilities? The LR and DFA revealed that the type of degree program and risk index were the two factors which most distinguished student veterans with disabilities from student veterans without disabilities. These two factors were identified as the most consistent predictors of disability status among student veterans. Looking very seriously at student attrition from higher education, student veterans with disabilities were more likely to have a lower risk index than student veterans without disabilities. Student veterans with disabilities were also more likely to be in bachelor's degree programs versus associate's degree or certificate programs. In the multivariate analyses, these two factors were the most significant predictors of disability status; however, major was also a significant predictor in that student veterans with disabilities were less likely to major in business or some other technical vocation. Those with disabilities were

more likely to major in the field of social sciences which include humanities and social work. Still, there was no difference among student veterans based on disability type for majors in the health, education, or STEM fields.

In a longitudinal study, undergraduate students with both apparent and non-apparent disabilities tended to persist at about the same rate as their undergraduate peers without disabilities (Wessel, Jones, Markle, &Westfall, 2009). Still, the risk of attrition increases with certain characteristics such as financial independence, part-time enrollment, etc. Given the challenges of an often times acquired disability, it is encouraging to learn that student veterans with disabilities have a lower risk index score as calculated by NPSAS than their student veterans without disabilities counterparts. Even so, the high risk index of these students regardless of disability status warrants special consideration by higher education administrators as they design programs to support special populations on college campuses. Student veterans with disabilities have a lower risk of attrition based on the risk index determined by NPSAS; however, all student veterans need support in order to complete their academic programs despite the challenges they may face from their personal situations.

It is unclear from the aggregate risk index variable if student veterans with disabilities are employed less often than their peers without disabilities while enrolled in school. Typically student veterans who fully exit from the military delay their initial enrollment in order to enter military service and secure educational benefits. Because of their military status, almost all of these veterans will have been financially independent when they do finally enroll in courses. Further analyses may distinguish whether student veterans without disabilities tend to have dependents, work full-time while they are enrolled, or are enrolled part-time only.

The lack of enrollment of student veterans with disabilities in STEM and business majors indicates a lack of appeal to these fields. STEM, in particular, can benefit from the upsurge of enrollment of capable adult students who have had successful careers in high-pressure careers like the military. However, the attraction of student veterans with disabilities to more social service oriented fields aligns with their prior commitment to public service. While many veterans choose higher education programs based on their roles in the military, future research may target the decision making process for veterans with newly acquired disabilities leaving military service and choosing brand new careers.

The competitive environments of STEM and healthcare, another major student veterans were less likely to enroll in, do not exclude mature adults with disabilities from pursuing employment in them post injury. While this study concentrated on postsecondary education, it assumes a motivation for post injury employment given the relatively young mean age of 24 years old for student veterans with disabilities. As of February 2012, the unemployment rate for people with disabilities was almost twice as high as the unemployment rate for people without disabilities, 15.8 and 8.4% respectively (Department of Labor, 2012).

Student veterans with disabilities tended to enroll in bachelor's degree programs at a higher rate than their peers without disabilities. According to Krause & Reed (2009), post injury educational attainment was the most likely predictor of employment after an injury. In the Krause & Reed study (2009), participants mainly enrolled in bachelor's degree programs. Without a longitudinal study, however, difficulty lies in predicting whether students enrolled in non-bachelor's degree programs intend on pursuing education beyond the initial certificate or two-year degree. With more student veterans with disabilities enrolled in bachelor's degree

rather than associate's degree programs, four-year institutions like the traditional university must practice just as much student-centered planning as community and two-year colleges.

The univariate analyses revealed equally interesting relationships between disability and enrollment characteristics. There was no significant difference in age amongst student veterans indicating that those with and without disabilities are roughly the same age; still, student veterans both with and without disabilities were older than the traditional undergraduate student according to Radford (2011). More males than females composed the group with disabilities possibly because the lack of females in direct combat fields in military occupations. Females composed about 28% of the sample of student veterans with disabilities. Even so, gender was not a significant predictor in either of the multivariate models.

To answer the question directly about whether or not a disability status affects the type of institution a student veteran with a disability chooses to attend, univariate and multivariate analyses agreed there was no difference. The choice between a distance learning program over a physical classroom is not related to a respondent's physical ability or disability. In fact, further analysis of the data shows there was no significant difference in distance learning program enrollment between those with a mobility impairment and those without a mobility impairment X^2 (1, N = 4363) = .053, p=.841.

Despite lacking the ability to discriminate between student veterans based on disability status in multivariate analyses, student veterans with disabilities had significantly lower GPA's than their peers with estimated power greater than .99. Despite the high statistical power of these results, it must be noted that the effect size for this relationship was minimal. Less than 10% of the variance can be attributed to the dependent variable of disability type. This sobering finding still suggests a need to further support those with disabilities in the classroom. Given their

similar age and military backgrounds, student veterans with disabilities have comparable abilities and experiences. Regardless of the academic competitiveness of either group, the overall mean GPA of 3.14 suggests a B average for student veterans. Without a longitudinal study to characterize the persistence or stop out rate of these students, a 3.14 GPA indicates above average academic performance. Further research can use an analysis of variance to estimate the interaction of disability type among GPA since those with cognitive disabilities may have more profound challenges reflected in their academic achievement.

This research used both DFA and LR to characterize the two groups based on the chosen predictor variables; however, only one analyses was necessary especially considering the similar treatment of the predictor variables. Of the two analyses, LR proved to have the most utility in terms of classifying more cases correctly and providing more interpretability based on the different levels of the categorical variables. The data set fit the tenability of assumptions of LR more so than DFA. Given the nature of the variables in the research question, LR accepted both the categorical and continuous variables with little compromise to the mathematical effectiveness of the model. Outliers and non-normality were the largest threats to the effectiveness of the DFA. Still, the sample size was large enough to indicate a high powered test which offers some insight to the group differences of student veterans based on disability status.

With the use of significant predictor variables in the model, LR would help higher education administration recognize veterans who may not disclose their disability. With a reliable odd-ratio in hand, administrators can put programs into place in the most likely places to reach student veterans who fail to register for accommodations or other support services. Based on significant predictors, institutions can put supports into place in order to anticipate need without violating students' privacy or right to not disclose a disability.

While a predictive model can help administrators to better characterize this population, nonsignificant discriminant models also reveal key information about student veterans. Regardless of disability status, student veterans have are very similar based on multivariate analyses. Certain factors such as major, program type, and risk index may differentiate the two groups; however, student veterans both with and without disabilities share several characteristics such as age and whether or not a student chooses a distance learning program. Bricks and mortar as well as online schools should prepare for mature adult students who may have a disability. Since there was no correlation in the participation in distance learning programs with disability status, even those with mobility impairments may consider bricks and mortar institutions just as often as online schools despite perceived issues of accessibility.

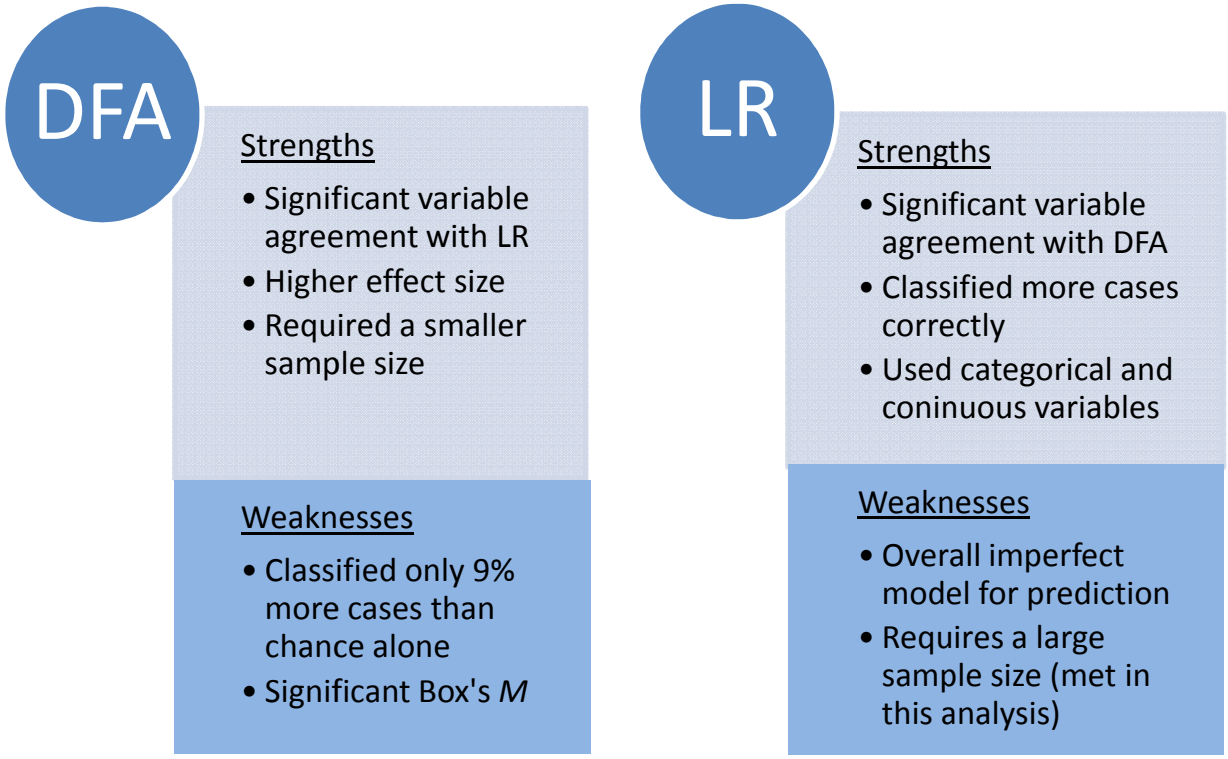

Figure 8. DFA & LR to Compare Student Veterans

Looking at the real life consequences of acquired disabilities, Matthew Reilly was finally able to discharge from Walter Reed before starting in a community college program. Unlike the majority of veterans with disabilities in this survey data, Reilly was enrolled in an associate's degree program which he recently completed (Sander, 2012). Still, his educational goals had to realign after his injury. After being turned away from nursing due to his disability, Sander decided to pursue a career and degree in psychotherapy in order to help veterans like himself make the difficult transition from life in the military to navigating a new life with a disability (Sander, 2012). Matthew Reilly exemplifies how a disability might delay, affect, and challenge the enrollment of student veterans with disabilities who enter into the military with every intention of receiving a college education. The experiences acquired during that combat service, however, can certainly impact the postsecondary path of student veterans.

Limitations

Using secondary data provided many benefits to this investigation. Previous researchers have used this particular data set to characterize student veterans and other postsecondary students. The data collection methods, scope, and breadth of NPSAS utilized resources and expertise difficult to secure. Using this previously collected and cleaned data allowed for a nationally representative investigation of student veterans.

However, secondary data has its limitations when used in any study addressing original research questions. Since initial data collection, variable building, and data cleaning were done without any control by this researcher, the nature of this data which was collected for other purposes can affect the results. A large portion of the variables in the entire NPSAS dataset

pertained to financial aid and how students paid for college, the original intent of NPSAS. Variables in this study were limited to what was available, relevant, and interpretable in NPSAS.

This study questioned whether disability status affected a student veteran's choice in a disatance learning program versus a bricks and mortar school. NPSAS operationalized the DISTALL variable in question by allowing students to skip the item if they were not enrolled in a distance learning program at all. However, the only other distance learning items included partial distance learning so students could have been primarily bricks and mortar students taking only one class online. DISTALL clarified whether a student who was taking any distance learning courses was solely a distance learning student. The research question in this study did not intend on including students who chose distance learning courses based on the convenience of time or limited course offering. Because of the way this variable was built in the initial data collection, a majority of the data was counted as missing. Counting all missing values as students who were not taking distance learning courses would take hazardous liberty with cases by assigning them to a category when they were truly skipped rather than missing. There were other rates of missing values; however, no variable contained as many missing values as DISTALL which was missing over two-thirds of cases in the multivariate analyses. The large sample size still allowed for high statistical power in all analyses, and a bivariate correlation indicated no missing values correlated with the dependent variable of disability status. However, a heightened level of criticism will accompany any variable or data set with the majority of values missing. Only complete cases were included in these analyses.

The total sample weights provided by NPSAS yielded frequencies far above the original sample size since these weights reflected a total undergraduate pool rather than a subpopulation of the undergraduates only. The most recent census data used to calculate undergraduates in the

United States was collected in 2000. This study based the total population of undergraduate student veterans on the percentage of undergraduates who were veterans in 2008 and the most recent census information from 2000. This is an inherent limitation of estimating population parameters; however, without the use of rebased weights for a subpopulation, the frequencies tended toward finding significant differences based on inflated group sizes alone.

Regardless of being a secondary data analysis, a common limitation of this type of survey research is the theory that self-report can have questionable accuracy depending on the construct and the respondent (Tourangeau, Rips, & Rasinski, 2000). Survey administrators gathered information for the dependent variable, DISABLE, from student interviews. Consequently, a student could choose not to disclose their disability to the interviewer. A student veteran could deny they had a disability to the interviewer or refuse to accept or acknowledge their disability. Perceived social stigma of a disability and having an acquired disability correlated with whether or not an individual learned to accept their disability (Li & Moore, 1998). Even with its limitations, self-report is the most reliable method of gathering such sensitive personal information like disability status. With this type of data collection, higher education institutions have the ability to assess the rate at which student veterans and other undergraduates disclose disability or request accommodations to assist learning.

Recommendations for Future Research

This study was meant to serve as an exploratory analysis of the disabilities student veterans must contend with in higher education and how those disabilities may affect their enrollment. Future research should include primary data sets collected with the intention of learning specific information about this population rather than a secondary data set adapted to alternative purposes. Previous literature has characterized the experiences of this population as

they make their way through postsecondary education and the ways in which they compare to their non military undergraduate peers (Zinger & Cohen, 2010; Radford, 2011).

A qualitative study can target the experiences and decision making processes of student veterans returning from combat into the classroom. Like this study, a more qualitative approach might investigate how an acquired disability affects academic performance, self-determination, as well as career and educational decisions. The significance of program major, degree program, and risk index warrant further qualitative inquiry on the decision-making processes and enrollment obstacles of student veterans. The amount of inference and assumptions required in a quantitative analysis, especially secondary data analysis, serves as an inherent limitation when the research needs to justify why or how a relationship exists. A more purposefully designed survey instrument or interview protocol can target whether or not student veterans with disabilities acquired those disabilities in combat or on the home front.

Further inquiry of student veterans can address stigma of disability and disclosure. Refusal to accept an acquired disability such as a cognitive or mobility impairment can play an important role in attaining accommodations in an educational institution. Further research can more closely investigate the risk of attrition of student veterans with and without disabilities as it may affect their maximization of the GI Bill as a resource. While this study did not utilize any of the financial variables available, future research can include financial inputs into the characterization of student veterans with disabilities who may or may not have more financial assistance through state or veterans' rehabilitation services. Using these variables may shed light on the significant difference in risk index for student veterans with and without disabilities. This research used a two-group analysis to compare those student veterans with and without disabilities; prior research compared student veterans as a whole to traditional and nontraditional,

independent undergraduates (Radford, 2011). For disability support officials, knowing how student veterans compare to the financially dependent undergraduate with a disability can facilitate further customization of support services.

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VITA

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RELEVANT EXPERIENCE AND QUALIFICATIONS

Evaluator, September 2010 – Present

Metropolitan Education Research Consortium, Richmond, Virginia.

Primary responsibilities include:

- Evaluation and study design for a DODEA grant award
- Survey instrument and interview protocol design
- Qualitative data analysis
- Quantitative data analysis and statistics(Microsoft Excel, SPSS)
- Data interpretation and report writing

Evaluation Consultant, August 2010 - Present

Rehabilitation Research Training Center, Richmond, Virginia

Primary responsibsssssssssssssssssssssssilities include:

- Evaluation of the Veterans Education Transition Supports in College program
- Develop tools and implement data collection activities for evaluation purposes (RedCap)
- Conducted multiple literature reviews on a variety of disability research related topics
- Co-authored content for the Virginia Department of Veterans Affairs website
- Consulted one-on-one with study participants
- Maintain research appointment status at McGuire Veterans Medical Center

Program Coordissnator, February 2010 to August 2010

J. Sargeant Reynolds Community College, Richmond, Virginia

Primary responsibilities included:

- Standardized admissions and placement testing procedures program-wide

- Initiated and co-authored a program review to be used in advisory committees
- Managed enrollment summaries, registration processes, and graduation progress (PeopleSoft, Access)
- Analyzed placement test scores for levels of high school preparation
- Identified and contracted effective professional development opportunities for faculty
- Tracked employment trends by ability levels of specialized populations
- Supervised two part-time employees and up to eight adjunct faculty members

Adult ESOL Teacher, December 2007 to February 2010
Chesterfield County Public Schools, Chesterfield, Virginia
Primary responsibilities included:

- Instructed a high-intermediate language class using best practices
- Developed, piloted, and instructed an English writing class
- Evaluated student progress through formative and summative assessments
- Tracked and reported progress and attendance daily for up to 18 adult students
- Certified through Virginia Adult Learning Resource Center in ESOL, Writing, and Teaching Adult Basic Education

Program Coordinator, February 2006 to July 2007
ABRIO Family Services, Flagstaff, Arizona
Primary responsibilities included:

- Established and coordinated program monitoring for state licensing compliance
- Supervised and trained eight staff members caring for clients with developmental disabilities
- Tracked and managed data regarding documented daily, monthly, quarterly, and yearly progress of clients
- Designed instruction based on prevocational industry, best practices, developmental appropriateness, and consumer goals
- Promoted to program coordinator after serving as direct support professional

EDUCATION

Doctor of Philosophy (Focus in education research & evaluation), Virginia Commonwealth University, Richmond, Virginia. *Expected graduation: May, 2012.*

Master of Arts in Education, University of Phoenix, Online. January, 2009.

Bachelor of Science in Journalism and Political Science (merged). Northern Arizona University, Flagstaff, Arizona. December, 2006

PROFESSIONAL AFFILIATIONS

American Evaluation Association (AEA), 2011 – Present

Association on Higher Education and Disability (AHEAD), 2010 - Present

Commission on Adult Basic Education (COABE), 2008 – Present

National Center of Measurement in Education (NCME), 2010 – Present

Virginia Education Research Association (VERA), 2011 – Present

AWARDS & DISTINCTIONS

Gates Millennium Scholar and Fellow, August 2002 - present

Extern, Commonwealth Education Policy Institute, Summer 2011

Northern Arizona University Director's Scholarship, August 2002 - May 2006

CONFERENCE PARTICIPATION & PUBLICATIONS

Metcalfe, Y. L. (2011). Survey methods in education research: Developing surveys for respondents with disabilities. Paper presented at *Virginia Education Research Association Annual Conference* in Charlottesville, VA.

Participant (2011). *Interagency Conference on Disability Research* in Washington, DC.

Grantee Evaluator (2010). *DODEA K-12 Grants Kick-off Conference in* Washington, DC.

Participant (2010). Association on Higher Education and Disability (AHEAD) in Virginia.

Gendron, T., White, J., Lockeman, K. S., Metcalfe, Y., & Aggarwal, S. (2011). The Efficacy of Cultural Competence Training for Healthcare Professionals Working with LGBT Older Adults. Manuscript submitted for publication.

TECHNICAL REPORTS

Metcalfe, Y.L. (2011). Process and impact evaluation report for A Caring Response: Cultural Competency and Sensitivity Training for Healthcare Professionals Providing Service to the Lesbian, Gay, Bi-Sexual and Transgender (LGBT) Aging Population, a Geriatric Training and Education (GTE) Initiative. Full program evaluation submitted to the Department of Gerontology, Virginia Commonwealth University.