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14. ABSTRACT

Results from these studies showed that participation in the Winter Sports Clinic and the National Veteran's Wheelchair Games positively impacts ones life. By participating in these organized events, positive psychosocial benefits may result to veterans with disabilities. Participation in adaptive sports increases after exposure to the Winter Sports Clinic and National Veteran's wheelchair games. Exposure to adaptive sports and sporting events should occur early in a patient's rehabilitation process to increase sports participation and to reap the long term benefits of socialization, community reintegration, health promotion, self-esteem, and functional independence. Additional findings yielded that the level of lower limb amputations determined the mobility choice (prosthesis or wheelchair). Interaction between utilization of prostheses and changing needs should be determined on a long term basis. This could suggest more viable alternatives, which could not only improve participation but, in long-term, have a positive impact on quality of life of those with lower limb amputation.

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Introduction

Objective and Specific Aims:

This protocol encompasses three different aspects of quality of life organized into three components: participation in recreational physical activity, training issues within sports participation, and mobility issues. All of these studies focus on individuals who use wheelchairs at some point in their daily activities. We have organized this research protocol for each component within the study, providing a brief background and significance of the research. With this study, participants are allowed to choose which component they would like to participate, and we have developed the informed consent document accordingly.

Training Component:

The primary objective of this component was to examine individuals with disabilities who participate in organized sporting events such as the National Veterans Winter Sports Clinic and the National Veterans Wheelchair Games to determine the rates and types of injuries sustained prior to and during the events, and how participation in particular training programs, previous sports experience, and nutritional programs may affect injury. The research questions which were addressed included:

- What are the types and locations of injuries sustained in these specific events?
- Do injury symptoms occur or reoccur during competition, training, or in daily activities?
- Are there any differences between those who sustain injuries and those who do not with regard to their training programs and adaptive equipment?
- Does sports experience impact the rate or type of injury?
- What is the effect of nutrition, weight, and supplementation on injury?

Mobility Component:

The primary aim of this component was to identify personal and performance characteristics of prostheses use by military and veteran personnel with lower extremity (LE) amputations and to identify how these characteristics influence the use of prostheses versus wheelchairs. Also, to investigate the functional performance and participation of the individuals who use LE prostheses or wheelchairs in lieu of their prostheses.

Hypotheses:

Hypothesis A: Individuals with lower level LE amputations will score more positively on functional performance and participation scales than individuals with higher level amputations.

Hypothesis B: Individuals who use prostheses more frequently will have higher functional performance and participation scores than those who use their prostheses less often.

Hypothesis C: Within the same levels of amputation, functional performance and participation scores will differ by prosthesis type.

Hypothesis D: Personal characteristics and co-morbid conditions are predictive factors for wheelchair use in lieu of prostheses for daily mobility.

Hypothesis E: Individuals who use their prostheses will score significantly higher on functional performance and participation than those who use wheelchairs in lieu of their prostheses.

Quality of Life Component:
The primary objective of this component was to examine individuals who participated in organized sporting events such as the Winter Sports Clinic and the National Wheelchair Games and to determine how participation in these events were perceived to have impacted on their life. The research questions, which were addressed, included:

1. What are the characteristics of (age, gender, years/injury, exercise habits, assistive technology use) of people who participate in the Winter Sports Clinic & National Veteran Wheelchair Games?
2. How has participation in these events impacted their lives?
3. Is there a relationship between participation in these events and their community participation (as measured by the Craig Handicap Assessment Reporting Technique (CHART)), quality of life and other psychosocial measures (e.g. self-esteem).

Body: Research Design and Methods

This study was a cross-sectional study, which examined quality of life in Veterans by examining three different components of quality of life: participation in recreational physical activity, training issues within sports participation and mobility issues. Participation in this study involved completing different questionnaires that focus on those three components. All individuals who agreed to participate had the option to complete one or all of the three questionnaires. Once informed consent was obtained subjects completed all relevant sections of the questionnaire. Subjects were then paid $25.00 for their time and effort.

Data Collection

Main Questionnaire:

Demographic information: Demographic variables included age, race, height, weight and gender. Socioeconomic variables include employment status, years of education, level of income and type of medical insurance. Medical status variables included disability, years of disability, past medical history, co-morbid conditions, training and injury history, and current medications.

Function: The Craig Handicap Assessment Reporting Technique (CHART)(18) was used to assess the outcomes of interest for both function and community participation. The CHART consists of several dimensions: physical independence, mobility, occupation, social participation and economic self-sufficiency. For each dimension, a total continuous score is calculated. A score of 100 for each dimension equates to no handicap in ability to perform the particular item/function being measured. Scores will be treated as continuous for purposes of data analysis.

Training Questionnaire:
Injury Questionnaire: variables collected included sports participation, injury history, symptom descriptors, training, adaptive equipment, and supplementation.

Medical information: variables collected during medical visits included the type, location, and severity of injuries and any associated medical problems, medical assessment, workup, and treatment.

Mobility Questionnaire

The Orthotics and Prosthetics Users Survey (OPUS) was incorporated into the study survey. The authors of the OPUS have granted investigators permission to use this outcome measure. The OPUS will determine level of ease in completing daily activities under a variety of environmental conditions. In addition information on the technology that individuals use will be collected as well. Types of prostheses used and wheelchair data (manufacturer, model, age of wheelchair, options) will be collected in addition to data related to use of other form of assistive devices.

Quality of Life Questionnaire

Quality of life was assessed by using portions of the WHOQOL-BREF. The WHOQOL was developed by the World Health Organization to assess quality of life. Two domains, physical health and environment have been selected to be included in our overall assessment of the subjects. Additional information will be gathered that encompasses pain, fatigue and self esteem. Self esteem will be measured by the R*osenberg Self-Esteem (RSE)* (20). The RSE is a reliable measure consisting of ten statements that ask level of agreement (4-point Likert scale). A total score is calculated, with a higher score indicating better self-esteem.

Bulleted list of key research accomplishments

Quality of Life Component

- One hundred-thirty two individuals participated in this portion of the study.
- The mean age of the predominantly male (87%) participants was 47.4±13.4 with an average of 13.4 ± 12.1 years since injury or diagnosis. The disabilities encompassed: 43% spinal cord injury, 33% amputation, 6% visual impairments, 8% multiple sclerosis, and 9% other. For the 57 individuals who listed spinal cord injury as their disability, 35% were tetraplegia and 65% were paraplegia.
- A total of 370 sports were listed by the 132 participants with 26% being ball sports and 20% snow sports. Fourteen percent of the sports were outdoor recreation, 12% were water, 10% track and field, 10% cycling, 5% physical fitness, and 4% as other. Individuals participated in an average of 2.8±2.1 total sports.
- It is recommended that veterans participate in events such as the NVWG and WSC which can result in improved psychosocial benefits to veterans with disabilities.
- See attached in press paper (Sporner et al, 2008) in appendix for complete results.

Mobility component:

- Forty-six veterans (N=46) with lower limb amputation, participated in this portion of the study. This sample was further divided in two groups namely: wheelchair group (n= 17) and prosthesis group (n= 29) to answer the research questions
- There was no significant difference in the combined functional performance score for individuals with lower levels of amputation as compared to individuals with higher level of amputation.
- More participants reported using prostheses with ease for activities that required less energy expenditure (using toilet=66%) compared to higher energy activities (traversing uneven terrains=25%). Also, for activities like ‘getting in and out of car/bus’ and ‘performing sports, a significant association ($p=0.04$ and $p=0.009$) was observed between prosthesis usage and level of difficulty.
- See attached paper in appendix

Training component:

- Ninety seven subjects participated in this portion of the study. Majority were males (n=79), with a mean age of 46.0 +/- 14.7 years. Primary disability included: 34 with amputations, 29 with Spinal cord injury, 9 with Multiple Sclerosis, 6 with visual impairments, 5 with polytrauma, and the remainder with a range of disabilities including peripheral neuropathy, stroke, etc).
- There was a significant difference in the total number of sports played over time ($p=0.001$), with more sports being played before disability ($p=0.003$) and after the NVWSC ($p<0.0001$) compared to after disability but before NVWSC participation. This difference existed regardless of type of disability acquired. Subjects only continued an average of 24.9% of sports they originally played. The average years since injury was 13.2 +/- 13.6 years, and subjects had attended the NVWSC an average of 1.8 +/- 4.1 years. The number of sports played was significantly correlated with years since disability ($p=0.001$, $r=0.408$). There was no relationship between the number of original sports continued after disability and history of wounds, injuries that interfered with training or playing sports, or access to adaptive equipment. More amputees (37%), most less than a year from injury, than other subjects reported wounds that interfered with sports participation ($p=0.031$).
- This portion of the study showed that participation in new adaptive sports increases over time after a disability but most of the increased participation occurs after exposure at the NVWSC
- Clinicians, trainers, and athletes should include adaptive sports and sporting events earlier in a patient's rehabilitation process to increase sports participation and to reap the long term benefits of socialization, community reintegration, health promotion, self-esteem, and functional independence.
- See attached paper (Franklin et al, 2007) in appendix for complete results.

Reportable outcomes

Papers: published or in press:

- Sporner ML, Fitzgerald SG, Dicianno BE, Collins DM, Teodorski E, Pasquina PF, Cooper RA, Psychosocial Impact of Participation in the National Veterans Wheelchair Games and Winter Sports Clinic, **Disability and Rehabilitation**, in press. *Please see appendix for copy of this paper*.
- Franklin AJ, Dicianno BE, Cooper RA, Pasquina PF, Fitzgerald SG, Winful CR, Athlete Participation in Adaptive Sports: Benefits of the National Veterans Sports Clinic, **Annual Meeting of the Association of Academic Physiatrists**, San Juan, Puerto Rico, April 10-14, 2007, published in American Journal of Physical Medicine and Rehabilitation, pp. S145-S146, Vol. 86, No. 4 (Supplement), April 2007. *Please see appendix for copy of this paper.*
- Karmarkar A, Collins DM, Pasquina P, Wichman T, Fitzgerald SG, Dicianno BE, Cooper RA, , Functional Performance and Satisfaction Related to Prostheses Use in Veterans with Lower Extremity Amputation (LEA), **Proceedings of the Annual RESNA Conference**, Phoenix, AZ, CD-ROM, June 15-19, 2007.

Papers: planned

- Karmarkar AM, Collins DM, Wichman T, Fitzgerald SG, Dicianno BE, Pasquina PF, Cooper RA. Prostheses and Wheelchair Use in US Veteran-Athletes with Lower Limb Amputation (LLA). American Journal of Physical Medicine and Rehabilitation. Submitted in November 2007, rejected March 2008. Lead author plans to revise and resubmit.

Conclusions

Results from these studies showed that participation in the Winter Sports Clinic and the National Veteran's Wheelchair Games positively impacts ones life. By participating in these organized events, positive psychosocial benefits may result to veterans with disabilities. Participation in adaptive sports increases after exposure to the Winter Sports Clinic and National Veteran's wheelchair games. Exposure to adaptive sports and sporting events should occur early in a patient's rehabilitation process to increase sports participation and to reap the long term benefits of socialization, community reintegration, health promotion, self-esteem, and functional independence. Additional findings yielded that the level of lower limb amputations determined the mobility choice (prosthesis or wheelchair). Interaction between utilization of prostheses and changing needs should be determined on a long term basis. This could suggest more viable alternatives, which could not only improve participation but, in long-term, have a positive impact on quality of life of those with lower limb amputation.

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Appendices:

We have included a copy of two papers that are either published or in press:

Athlete Participation in Adaptive Sports: Benefits of the National Veterans Winter Sports Clinic

Allison J. Franklin, DO[3]; Brad E. Dicianno, MD[1,2]; Rory A. Cooper, PhD[1,2]; Paul F. Pasquina, MD[3]; Shirley G. Fitzgerald, PhD[1,2], and Candice R. Winful, MD[1].

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Introduction

Between 2 and 3 million athletes with physical and mental disabilities compete in organized competition each year in the U.S.[1]. Events such as the Paralympics, Special Olympics, and those sponsored by the Veterans Administration are attempts to increase sports participation in individuals with disabilities not only for health and socialization benefits, but also as part of an individual's rehabilitation after acquiring a disability. Although the psychosocial and health benefits of sports participation have been well documented[1,2,3,4,5], it is not known whether exposure to adaptive sports at such large events translates to regular sports participation outside of such events.

At the National Veterans Winter Sports Clinic (NVWSC), over 350 athletes with spinal cord injuries, amputations, visual impairments, and other disabilities participate in sports such as downhill and cross-country skiing, scuba diving, sled hockey, snowmobiling, rock climbing, and shooting sports. The clinic provides a variety of adaptive equipment that can reintroduce individuals to sports they had played before a disability or promote participation in a new sport. With advancing technology, adaptive equipment is now safer such that athletes with disabilities sustain fewer overall injuries, with an injury rate which is the same as that for athletes without disabilities[6,7]. Better equipment has also allowed individuals with disabilities to achieve and even surpass records held by individuals without disabilities[1,8]. Yet, because equipment is often expensive or inaccessible outside of a large event, it is not known whether individuals continue to participate in sports after exposure at these events.

It is important for large organizations, clinicians, trainers, and athletes themselves to know whether attending such events could be of benefit to the disabled athlete. If successful in reintroducing sports participation to those with new disabilities, large sporting events could be incorporated into standard rehabilitation programs and allow for early exposure to adaptive equipment and prosthesis modifications. The objective of this study was to compare the sports participation of disabled athletes before and after the NVWSC.

Our hypotheses were: 1) The total number of sports played will be different over time, with subjects playing more sports before injury and after the NVWSC, compared to after acquiring a disability, 2) The percent of sports continued after disability will be related to the presence of wounds or injuries that interfere with sports participation and access to adaptive equipment, and 3) The number of sports played will be significantly correlated with the number of years since acquiring disability.

Research Design and Methods

This was a cross-sectional survey study that examined the relationship between sports participation before and after participation in the 2005 NVWSC in Snowmass, CO. All subjects signed an informed consent form prior to completing the questionnaires. The survey included questions about demographics, sports participation, disability history, injury and other medical history, and access to adaptive equipment. Outcome measures were the number of sports played on a regular basis before acquiring a disability, after disability, and since attending the NVWSC. We calculated the percent of sports that were continued after a disability was acquired. We also recorded whether or not subjects' sports participation had been affected by wounds, injuries, or access to adaptive equipment.

Statistical Analysis

We set all alpha levels to 0.05 *a priori*. We used a Repeated Measures Analysis to evaluate differences in total number of sports played over time, using time as a within subjects factor and disability type as a between subjects factor. We used Independent Samples t-tests to evaluate for a relationship between the percent of sports continued after acquiring a disability and history of wounds, secondary injuries that interfered with training or playing sports, or access to adaptive equipment. We compared disability groups with respect to injuries, wounds, and equipment access using Chi-Square Analysis. A Pearson Correlation was used to evaluate for a relationship between number of sports played and years since disability.

Results

Ninety seven subjects consented to this study, and ninety one completed all surveys. There were 79 males (86.8%) and12 females (13.2%). Mean age was 46.0 +/- 14.7 years. Race distribution was as follows: 63 (69.2%) White/Caucasian, 12 (13.2%) Black/African-American, 10 (11.0%) Hispanic, 3 (3.3%) Other, 2 (2.2%) American Indian, and 1 (1.1%) Asian-American. Primary disability was as follows: 29 (31.9%) with isolated Spinal Cord Injury, 34 (37.4%) with one or more amputations, 9 (9.9%) with Multiple Sclerosis, 6 (6.7%) with visual impairments, 5 (5.5%) with polytrauma, 2 (2.2%) with diffuse peripheral neuropathy, 2 with isolated orthopedic injuries, 1 (1.1%) with isolated peripheral nerve injury, 1 with Stroke,1 with Neurofibromatosis and Poliomyelitis, and 1 with both Parkinson's Disease and orthopedic injuries.

Subjects reported playing a mean of 2.8 +/- 2.1 sports before acquiring a disability (Range 0-9). After disability, this dropped to 2.1 +/- 1.7 (Range 0-7). After the NVWSC, subjects increased participation to an average of 2.7 +/- 2.1 sports (Range 0-9). After acquiring disability, subjects continued an average of 24.9 +/- 33.8 percent of the original sports that they played.

There was a significant difference in the total number of sports played over time ($p=0.001$), with more sports being played before disability ($p=0.003$) and after the NVWSC ($p<0.0001$) compared to after disability but before NVWSC participation. This difference existed regardless of type of disability acquired.

The average years since injury was 13.2 +/- 13.6 years, and subjects had attended the NVWSC an average of 1.8 +/- 4.1 years. The number of sports played was significantly correlated with years since disability ($p=0.001$, $r=0.408$).

There was no relationship between the number of original sports continued after disability and history of wounds, injuries that interfered with training or playing sports, or access to adaptive equipment. However, significantly more amputees (37%) than subjects with other disabilities reported wounds that interfered with sports participation ($p=0.031$). However, the majority of amputees were less than 1 year from injury. Overall, 35% of subjects reported previous injuries

that affected training or participation in sports, and 33% of subjects reported they would play even more sports if they had appropriate adaptive equipment.

Discussion

Previous research has documented that disability results in reduced sports participation[9,10,11] and that after acquiring a disability, individuals begin to participate in sports again for peer support, socialization, fun, joy of competition, and improved health[2,3,4,11]. This study showed that subjects, after acquiring a disability, continue only one fourth of the sports they originally played, and that after attending the NVWSC, sports participation increased back to the level before disability, such that athletes were participating in mostly new sports.

Subjects played more sports on a regular basis if they had acquired a disability longer ago, suggesting a gradual adoption of more sports as they adjusted to having a disability. However, it is likely that the NVWSC played a role in increasing participation since the athletes in our study had been attending the NVWSC for only an average of 2 years, had acquired a disability an average of 13 years prior, and did not increase sports participation until after attending the NVWSC. This finding is significant because most athletes who resume sports participation do so using advice from peers or by trial and error[11,12] and lack sufficient guidance for adaptive sports. The NVWSC is an example of an event that can introduce new sports while providing professional training.

Surprisingly, our study showed that lack of access to appropriate adaptive equipment did not affect the number of sports an individual continued after sustaining a disability. An increase in dependency, a change in social relationships, or loss of sports skills can result in decreased sports participation[2]. However, it is also possible that after acquiring a disability, subjects may have preferentially chosen to participate only in sports that required little or no adaptive equipment. This may explain the high percentage of discontinued sports. Subjects indicated that skiing was the most common summer or winter sport they would engage in regularly if adaptive equipment were more accessible. While responses may have been biased because of exposure to the sport, this shows that the NVWSC provides adaptive equipment that allows participation in sports that may not otherwise occur. One-third of participants would play more sports if they had equipment to do so. Further investigation is warranted into the potential health benefits and cost savings of providing appropriate adaptive equipment to athletes with disabilities for use on a regular basis.

Even though a high percentage of subjects had wounds and secondary injuries that interfered with sports participation, the percentage of sports continued after sustaining a disability was not related to these factors. This suggests that individuals participate in sports despite experiencing medical complications. Education of participants with disabilities, instructors, and medical personnel on proper wound and injury care and prevention throughout sporting events may minimize secondary disability and enhance sports performance.

This study showed that participation in new adaptive sports increases after exposure at the NVWSC. Clinicians, trainers, and athletes should include adaptive sports and sporting events earlier in a patient's rehabilitation process to increase sports participation and to reap the long term benefits of socialization, community reintegration, health promotion, self-esteem, and functional independence.

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Psychosocial Impact of Participation in the National Veterans Wheelchair Games and Winter Sports Clinic

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Keywords: exercise, sports participation, assistive technology, National Veterans Wheelchair Games, National Veterans Winter Sports Clinic, functional independence, activities of daily living, quality of life, self-esteem

Abstract:

Purpose: The purpose of this study was to determine the characteristics of individuals who participate in the National Veterans Wheelchair Games (NVWG) and the Winter Sports Clinic (WSC) for veterans with disabilities. In addition, it was of interest to determine how these events had impacted their lives.

Method: Participants were recruited at the 20th Winter Sports Clinic, held in Snowmass Colorado and the 26th National Veterans Wheelchair Games held in Anchorage, Alaska. Data of interest included demographic, sport participation information, community integration, self-esteem, and quality of life. A secondary data analysis was completed to determine how comparable individuals who attended the NVWG/WSC were to individuals who did not participate in these events.

Results: The 132 participants were a mean age of 47.4±13.4 and lived with a disability for an average of 13.4±12.1. Participants felt that the NVWG/WSC increased their knowledge of sports equipment (92%), learning sports (89%), mobility skills (84%), and acceptance of disability (84%). The majority of participants stated that the NVWG/WSC improved their life. Of those who participated at the NVWG/WSC, they tended to be more mobile, but have increased physical and cognitive limitations as measured by the CHART when compared to the non-attendees.

Conclusions: Recommending veterans participate in events such as the NVWG and WSC can provide psychosocial benefits to veterans with disabilities.

Introduction

To date, much research [1-11] has been completed on the benefits of exercise and participation in sporting events. Results from studies completed on the general population [2-4] over the past 20 years have shown that consistent exercise can lead to increased cardiovascular performance, increased muscular strength and flexibility, improvement in body composition and decreased fatigue [3]. While the physical benefits have been well documented, inconsistencies remain in the psychological benefits [5-11]. Moses et al queried 75 sedentary adults living in the community and found that those in a moderate exercise group were found to have positive psychological responses, compared to those in the high exercise or attention-placebo conditions. [5] The results also indicated that better mental outcomes were not a result of aerobic fitness but rather the activity of participation. Moses et al theorized that the high intensity exercise was too demanding and therefore the intensity diminished the improvements in well-being. In addition, it was hypothesized that the moderate intensity exercise was found to be more enjoyable as desired results of the subjects were seen without exerting more effort than necessary [5]. Lane and Lovejoy [6] determined that immediately following aerobic dance exercise class, those who exercised felt a reduction in anger, confusion, fatigue and tension. They also found that for individuals who exercised and exhibited depressed moods prior to exercise showed greater improvements than individuals who did not display a depressed mood [6]. Additional benefits such as a resistance to fatigue, improved social skills, and psychological health have all been found in studies involving individuals without disabilities [7-9].

Recreational technology and adaptive sports

Participation in adaptive sports has been steadily rising due to the development of better equipment and an increase in opportunities for participation. It is estimated that in the United States two to three million individuals with physical and mental disabilities compete in organized competition each year [12]. The National Veteran Wheelchair Games (NVWG) and the National Disabled Veterans Winter Sports Clinic (WSC) are two events offered to veterans. The NVWG is a multi-event sporting and rehabilitation program for veterans who use wheelchairs and currently is the largest annual wheelchair sporting even in the world [13]. The NVWG began in 1981 and have since hosted thousands of veterans with disabilities with the aim to restore their competitive side through participating in sports [13]. In 1987, the WSC was started with the goal to instruct veterans who had disabilities in adaptive skiing, and other adaptive recreational activities and sports [14]. Just as with the NVWG, the goal of the WSC was to encourage veterans to become aware of their abilities and potential while promoting healthy activity and camaraderie as well as improve the quality of life for veterans with disabilities and fostering better health. While past Games have produced a number of national and world-class champions, the event also provides opportunities for newly injured veterans to gain sports skills and be exposed to other wheelchair athletes [14]. Martin et al [15] found veterans who participated in the NVWG had significantly less depressive symptomatology than those who did not participate in organized sporting events [15].

This ability to participate in adaptive sports is largely due to the advancing technology, which has produced adaptive equipment [16-17]. Technology advances have produced adaptive equipment allowing individuals with disabilities to achieve and even surpass records held by individuals without disabilities [16-17]. With respect to the impact of exercise on civilians with disabilities, Wetterhahn, Hanson, and Levy examined the differences between minimally active and active individuals with lower limb amputations. Significant differences between the groups were seen in outcome measures of appearance assessment, fitness evaluation, and fitness orientation with individuals in the active group reporting better score than individuals who are minimally active. These findings link the benefits of exercise in individuals with amputations, citing increase in body image as a benefit [18]. Hicks et al. [19] revealed that individuals with a spinal cord injury

who participated in an exercise program twice a week reported a greater health related quality of life, less pain and stress and fewer depressive symptoms than individuals in a non-exercise control group. Additional research [20] has shown that after participating in an organized sport course that included skiing, canoeing, abseiling and gliding, individuals with a spinal cord injury showed significant improvement in self-efficacy, satisfaction with leisure, and motivation to participate in activities. In addition, the participants showed a significant decrease in anxiety after participating in the sports course [20]. While significant physical and psychological benefits of exercise exist, research has also shown that few individuals with a spinal cord injury are sufficiently active to experience the benefits of exercise and sports participation [21].

The purpose of this study was to determine the effects of participation in the National Veterans Wheelchair Games and the National Veterans Winter Sports Clinic (NVWG/WSC). Specific questions to be asked included 1) What are the characteristics of (demographics, disability, types of participation in recreational physical activities) people who participate in the NVWG/WSC and 2) How has participation in these events impacted their lives - is there a relationship between participation in these events and their community participation, quality of life and other psychosocial measures (e.g. self-esteem)? In addition, a secondary data analysis was then completed to determine how this group of participants who participated at these events compared to individuals who did not participate in these events.

Methods

Research Design

This cross-sectional study was centered on quality of life and encompassed three components: participation in recreational physical activity, training issues within sports participation and mobility issues. Participants had the option to enroll in any three of the components. This paper will focus on the participation in recreational physical activity and its impact on quality of life. Prior to collecting any data, the study was approved by all applicable ethics committees.

Subjects & Recruitment

Participants were recruited at the 20th Winter Sports Clinic, held in Snowmass Colorado and the 26th National Veterans Wheelchair Games held in Anchorage, Alaska. For both events, the Human Engineering Research Laboratories (HERL) had a designated research area that displayed information about the laboratories and the research being completed. Persons, who approached the booth and inquired about the research study and indicated an interest in participating, were provided an informed consent document. After the subjects read the document and/or had the study explained to them, they were asked to provide informed consent. After informed consent was obtained, eligibility criteria were determined, and the participants were asked to complete the questionnaire.

Key variables and Questionnaires collected

Demographic information: Demographic variables collected included age (years), race (African-American, American-Indian, Asian-American, Caucasian, Hispanic, and Other), years since injury or diagnosis, gender and marital status. Socioeconomic variables were employment status and household income. Information was also collected on type of disability by asking respondent whether they had a spinal cord injury (SCI), amputation, visual impairment, or other. Subsequent questions regarding the specifics of the given disability were also asked, such as level of SCI injury and/or amputation.

Sports Participation: Sports participation was queried in two separate methods: participation in regular recreational activities and participation in specific organized sporting events. Through open-ended questions, participants were asked to describe the sporting and recreational athletic

activities they have participated in on a regular basis since their injury or diagnosis. Subsequently, these answers were categorized into eight categories (snow related, water related, ball sports, outdoor recreation, track and field, cycling, physical fitness and other). (See Table 1) Additional questions were asked regarding the participation in specific organized sports such as rugby, wheelchair basketball, or events such as the NVWG, the WSC, or ski spectacular. The total number of sports that each subject participated in as well as their years of participation was also calculated

INSERT TABLE 1

Impact of National Veteran Wheelchair Games and Winter Sports Clinic: Participants were first asked if the NVWG or WSC had improved their life and then were asked to specify which aspects of their life had been affected (yes/no responses). In addition, participants were asked how participation at the NVWG/WSC affected four key areas by providing a rank for each from one (most affected) to five (least affected). Areas listed were: 1.) increased friendships, 2.) ability to be competitive, 3.) improvements in physical endurance, and 4.) interaction with others who have a similar disability Because of misinterpretations of the question, not all subjects answered. In addition, data distributions were skewed and thus a dichotomous score resulted by classifying scores of one or two as "very affected" and scores of three to five as "somewhat affected".

Community Integration and Social Participation: The Craig Handicap Assessment Reporting Technique (CHART) [22] was used to assess the outcomes of interest for community integration and participation. The CHART consists of several dimensions: physical independence, mobility, occupation, social participation and economic self-sufficiency. For each dimension, a total continuous score is calculated. A score of 100 for each dimension equates to no handicap in ability to perform the particular item/function being measured. Scores were treated as continuous for purposes of data analysis.

Quality of Life: Quality of life was assessed by using portions of the World Health Organization Quality of Life – Brief (WHOQoL-BREF) tool [23]. The WHOQoL was developed by the World Health Organization to assess quality of life. While the WhOQoL has four domains, only physical health and environment were included in the overall assessment of the subjects. Average scores for each domain were calculated according to the developer's recommendations. Ranges for physical health and environment can fall between four and twenty with higher scores reflecting better quality of life. Total quality of life score can range from 17 to 85 with higher scores reflecting better quality of life.

Self-esteem: Self esteem was measured by the Rosenberg Self-Esteem (RSE) [24] The RSE is a reliable measure consisting of ten statements that ask level of agreement (4-point Likert scale). RSE was scored as recommended; scores can range from 10 to 40 with a higher score indicating better self-esteem.

Data Analysis

Initially, frequencies of all variables were examined. Due to distributions, several variables were collapsed prior to data analysis. Marital status was collapsed to together (married or living with someone as married) and single and household income was dichotomized into less than $35,000 and greater than or equal to $35,000.

All data were examined for normality and missing data. Appropriate statistical analyses were then used as needed. Demographic information was described using means and standard

deviations for continuous variables (e.g., age and years since diagnosis or injury) and frequencies and percentages for categorical variables (e.g., disability type, gender, and race). To assess impact of participation in the NVWG and the WSC as well as the types of sports people participated in, percentages and frequencies were used to describe the data.

As has been previously stated, a secondary data analysis was desired to determine how individuals who attended the NVWG/WSC comparable to individuals who did not participate in these events. Individuals in the comparison group were from a different study that was focused on service animals (here after known as 'the comparison group' [25]. Similar data included information on demographics, quality of life measures and community participation. Because authors of this paper were investigators on the other study, it was possible to determine overlap in participants and thus develop a unique group of individuals who did not attend the NVWG/WSC. People in the comparison group were recruited through the HERL Wheelchair Users Registry. The Registry is a database of individuals who have participated in research through the Laboratories before and have given their consent to be contacted with information regarding research studies they may be eligible to participate in [26]. Additional recruitment methods included study advertisements placed in the HERL newsletter and on the HERL website as well as brochures sent to service dog agencies to distribute their clients. All individuals in this comparison group were over the age of 18 and used a wheelchair for their primary mobility needs. Given all subjects in the comparison group used a wheelchair for mobility, it was decided to limit the secondary data analysis to only those participants in the NVWG/WSC study who used wheelchairs as well.

Subsequent analysis then examined the NVWG/WSC participants to the comparison group of non-attendees using the appropriate univariate statistics (chi-square, t-test). Results from the univariate analysis between groups showed significant differences in demographics, most likely because a separate study had been used as the comparison group. Those demographic differences included type of disability; disability years, gender, and race. Given that there were inter-correlations between these demographic variables, comparisons of the psychosocial outcomes measures controlled for those differences using an ANCOVA. The strongest correlate which was disability type was used as the covariate, the outcomes measures (e.g. CHART, Quality of Life) as the dependent variable and the attendee (NVWG/WSC) and the non-attendee groups as the between factor. SPSSv14.0 was used for all analyses and statistical significance was set at $p < 0.05$ *a priori*.

Results

One hundred-thirty two individuals were consented to participate in the overall study, with all individuals completing the quality of life sections. Data from all 132 individuals were used to determine the characteristics of the NVWG /WSC population. For the analysis that included the control group from the separate study, only data from those who used a wheelchair were analyzed.

Demographic information (N=132)

The mean age of all participants was 47.4$\pm$13.4 and time since injury or diagnosis 13.4$\pm$12.1 years. Eighty-seven percent of the population was male and 13% were female with 67% being Caucasian. The disabilities encompassed in this study included 43% spinal cord injury, 33% amputation, 6% visual impairments, 8% multiple sclerosis, and 9% other (stroke, post polio syndrome, and diabetic neuropathy). For the 57 individuals who listed spinal cord injury as their disability, 35% were tetraplegia and 65% were paraplegia. Table 2 displays a breakdown of demographic variables collected.

INSERT TABLE 2

Participation in NVWG and WSC and other organized sporting events
Thirty-two percent of the population stated that they have participated in both the WSC and the NVWG events. Twenty percent participated only in the NVWG and 48% participated only in the WSC. Of the individuals who enrolled in this study, 63% stated it was their only participation in an 'organized event'. Of those participants that participated in other events, 4% participated in rugby with a mean participation of 3.0±2.8 years, 15% on a wheelchair basketball team for an average of 6.6±8.4 years, 8% in the ski spectacular for 1.9±1.1 years, and 20% in "other" 1.6±1.3. Other sports listed include other VA and organized games, national and international sporting competitions, outdoor events, and marathons.

Sports Participation (non-organized sporting events)
A total of 370 sports were listed by 112 participants, ten individuals did not participate in any recreational activities. Of the 370 sports listed, 26% were ball sports and 20% were snow sports. Fourteen percent of the sports were outdoor recreation, 12% were water, 10% track and field, 10% cycling, 5% physical fitness, and 4% as other. Individuals participated in an average of 2.8±2.1 total sports for 8.7±10.7 years.

INSERT TABLE 3

Aspects of life impacted by participation at the NVWG/WSC are shown on Table 3. Knowledge of sports equipment (92%) and learning sports (89%) were chosen most frequently by the participants. The feeling that participation increased mobility skills and acceptance of disability were also chosen frequently. An overwhelming majority of veterans (98%, n=123) stated that their participation in the NVWG or the WSC has improved their life. Participants ranked "increased friends" as the area most affected by attending the NVWG/WSC, followed by the ability to be competitive. Subjects rated increased friends and ability to be competitive as areas that were most affected by participating at the NVWG/WSC. Table 4, provides a summary of these findings.

INSERT TABLE 4

Community Participation, Quality of Life, and Self-Esteem Outcomes
Outcome measures for all 132 NVWG/WSC participants are shown in Table 4. As higher CHART scores indicate better participation with a top possible score of 100, subjects in the study scored high in mobility and social integration (93.4±15.4; 92.4±19.8, respectively). Interestingly CHART scores for physical independence and occupation were much lower (69.1±43.2; 67.7±33.0, respectively). Similarly, higher scores on WHOQoL and RSE reflect better quality of life and self-esteem. Participants showed similar physical health and environment scores on the WHOQoL (14.2±2.7; 15.4±2.6) and an overall QoL score of 63.6±9.1. This population also displays high self-esteem scores, 34.3±5.5 out of a possibly 40.

INSERT TABLE 5

Table 5 provides an overview of the demographic characteristics between the NVWG/WSC and comparison group. As can be seen, there were significantly different types of disabilities in the comparison group than in the study population. In addition, individuals in the comparison group had significantly higher years living with a disability at 22.6±13.9 years than the veterans with 13.6±11.8 years and had a higher percentage of females and Caucasians. Table 6 provides an outline of the means and standard deviations for both groups encompassing the outcomes of interest. As can be seen, when disability type is controlled for, the comparison group had significantly higher measures in the physical ($p=0.001$) and cognitive ($p=0.002$) components while the veterans group had significantly higher mobility ($p=0.03$) and social integration ($p=0.04$) components.

INSERT TABLE 6

INSERT TABLE 7

Discussion

Anecdotally, when talking to the athletes at VA events such as the NVWG and WSC, all speak to the benefits that are afforded from participating. Results from this paper confirm that participation positively impacts their life as the majority of the participants expressed that their lives have been improved. Additionally, many veterans stated that they had gained confidence and motivation which is one of the goals of these sporting events. The confidence these veterans gained from the NVWG and WSC is possibly due in part to the camaraderie the participants maintain with each other. Previous research has shown that individuals who have commonalities are more comfortable with each other. [27] Many of the veterans who were interviewed stated they look to fellow service members for support and find it easier to get close to other veterans because they share similar experiences; our interactions with veterans at the NVWG/WSC support this finding. As demonstrated in the data there are many veterans present at the NVWG/WSC that do not participate in sporting and recreational activities outside of the VA events. Thus, the NVWG and WSC provide an opportunity for veterans to participate in sporting and recreational activities without the pressure to perform at professional levels (such as the Paralympics).

As shown by the difference is CHART scores between the NVWG/WSC group and Comparison group, the NVWG/WSC had significantly higher mobility and social integration scores than those who did not participate in those events. Interestingly, though there were also significant differences in the Physical and Cognitive scores of the CHART, with the NVWG/WSC having lower scores. This suggests that the group who chooses to attend the NVWG/WSC may have additional functional limitations.

It was recognized early on in the study design that it would be best to collect data from veterans whether they attended or did not attend the NVWG/WSC. Limits within funding prevented such a study from occurring. In an effort to control this limitation, a second study, which had all ready been completed, was used as a comparison group. While similar measures were collected by the other study using the same questionnaires, self-esteem was not collected. There was no way to determine the activity level of the comparison group.

It is possible that the population who attends the NVWG/WSC are a very active population of people and may differ in other characteristics from those veterans who do not wish to participate or who are unable to participate due to financial reasons. Many VA Medical Centers (VAMCs) assemble teams that attend the NVWG and WSC. Many of the VAMCs are also fortunate to have clinicians/therapists who encourage participation, and seek funding to support those ‘athletes’

who are new to the attending these events. Although the veteran's financial circumstances may prevent him/her from attending future games as participation; many veterans' organisations provide assistance with funding athletes.

Anecdotally, the newly injured global war on terrorism (GWOT) veterans are a different group than those who were injured from previous wars. Of those who participated in the study, 35 were injured in the past five years, indicative of being GWOT veterans. Previous analysis on this data has shown those who are new to participating at the NVWG/WSC had lower scores on the quality of life and self-esteem measures than those who had been participating for longer periods of time [28]. Events such as the NVWG/WSC could possible help these newly injured veterans with improved adjustment to life after injury as well as to help with other co-morbidities such as Post traumatic stress disorder (PTSD).

Donta et al. [29] found that in Gulf War Veterans, exercise alone, or in combination, with Cognitive Behavioral Therapy has a significant positive impact in decreasing fatigue, distress, and cognitive symptoms and increasing mental health functioning [29]. Similarly, Manger et al. [30] found a reduction in PTSD, anxiety, and depression following a 12-session aerobic exercise program. Decreases in symptoms were still present at one month post intervention [30]. According to the Ruzek, the Department of Veterans Affairs, and the National Center for Post Traumatic Stress Disorder [31], exercise in moderation may provide benefits to those experiencing PTSD by reducing physical tensions or distracting the individual from their memories. According to Ruzek, exercise may improve the individual's self-esteem and also create feelings of control in their life [31]. A study of 14 Australian Vietnam Veterans qualitatively evaluated the impact of a twice weekly exercise class with program duration of 40 weeks [32]. Five veterans were diagnosed with PTSD, with all participants reporting at least one PTSD symptom. All participants self-reported at least one change in some aspect of their lifestyle with increased mental awareness, feeling more relaxed and less distressed, and increased social interactions as some psychological benefits listed [32]. This is important because, according to the Department of Veterans Affairs, in 2004 there were an estimated 25 million veterans in the United States [33]. Many veterans and current military personnel have shown signs of severe Post Traumatic Stress Disorder, anxiety, and depression [34-36]. Participation in exercise and recreational activities may be one way veterans can better deal with these types of problems

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Table 1: Sports Categories

Sport Category	Specific Sporting or Recreational Activity
Snow	Down hill Skiing (Mono/Bi-Ski) Snowboarding Cross Country Skiing Snow Shoe
Water	Swimming Scuba Diving/Snorkeling White water rafting Canoeing/Kayaking
Ball	Basketball Football Soccer Softball/Baseball Hockey Rugby Tennis/Racquetball Table soccer/tennis
Track and Field	Walk/Jog/Run Marathon Triathlon Discus/Shot put
Cycling	Bicycle Handcycle Stationary Bike
Physical Fitness	Tai Kwon Do Weight lifting Yoga Pilates Exercising
Other	Fencing Billiards/Nineball/Pool Darts Crafts

Table 2: Demographic Characteristics of Study Participants

Characteristics	National Veterans Wheelchair Games and Winter Sports Clinic % (n=) or mean (±SD)
Disability Types	
- Amputation	43.2 (57)
- Spinal Cord Injury	33.3 (44)
- Visual Impairments	6.1 (8)
- Multiple Sclerosis	8.3 (11)
- Other	9.1 (12)
Disability years	13.5±(12.1)
Age	47.4±(13.4)
Race[1]	
- African America	19.1 (25)
- American Indian	1.5 (2)
- Asian American	0.8 (1)
- Caucasian	67.2 (88)
- Hispanic	8.4 (11)
- Other	3.1 (4)
Female	12.9 (17)
Employed	24.2 (32)
Married/Living Together	52.7 (69)
Household Income greater than $35,000[2]	56.3 (71)

1. n=131
2. n=126

Table 3: Areas of life impacted by participation at the NVWG/WSC

Aspects of Life	Percentage of people who responded yes (N=119) % (n)
Knowledge of sports equipment[1]	91.5 (107)
Learning sports	89.1 (106)
Acceptance of your disability	84.0 (100)
Mobility skills	84.0 (100)
Knowledge of your standard equipment[1]	80.3 (94)
Personal relationships[1]	77.8 (91)
Participation in society[2]	77.1 (91)
Communication skills with friends & family	73.1 (87)
Life in your home	64.7 (77)
Self care[2]	62.7 (74)

1. Missing 2 responses
2. Missing 1 response

Table 4: Ranking of Key Areas Impacted by NVWG/WSC

Key Areas of Life	Number of veterans who responded	Percent that stated "very affected" % (n)
Increased friends	63	79.4 (50)
Ability to be competitive	56	64.3 (36)
Improvements in physical endurance	57	61.4 (35)
Interaction with others who have a similar disability	79	83.5 (66)

Table 5: Outcome Measures for all National Veterans Wheelchair Games and Winter Sports Clinic Participants

Quality of Life Measure	Mean (standard deviation)
Craig Handicap	
- Physical	69.1 (43.2)
- Cognitive	78.4 (31.4)
- Mobility	93.4 (15.4)
- Occupation	67.7 (33.0)
- Social	92.4 (19.8)
- Economic	81.3 (32.8)
Quality of Life	
- Physical Health	14.2 (2.7)
- Environment	15.4 (2.6)
- Total	63.6 (9.1)
Self-esteem	34.3 (5.5)

Table 6: Demographic comparison for NVWG/WSC participants and Comparison Group

Mean±(std. dev.) or Percent (n)	ALL (n=247)	NVWG/WSC (n=111)	Comparison (n=136)	p-value
Age	48.2±(12.4)	47.6±(12.7)	48.7±(12.5)	.479
Disability				
Spinal Cord Injury	44.9 (111)	51.4 (57)	39.7 (54)	
Amputation	15.8 (39)	28.8 (32)	5.1 (7)	.000
Multiple Sclerosis	17.4 (43)	9.9 (11)	23.5 (32)	
Other	21.9 (54)	9.9 (11)	31.6 (43)	
Disability years[1]	19.3±(13.8)	13.6±(11.8)	22.6±(13.9)	.000
Female	38.1 (94)	14.4 (16)	57.4 (78)	.000
Caucasian[2]	82.4 (201)	67.3 (74)	94.8 (127)	.000
Employed	27.5 (68)	22.5 (25)	31.6 (43)	.111
Married/living together[3]	48.8 (120)	52.7 (58)	45.6 (62)	.265

1. 34 missing (All in NVWG/WSC)
2. 3 missing (1 in NVWG/WSC, 2 in Comparison)
3. 1 missing (All in NVWG/WSC)

Table 7: Outcome measures for veterans who use a wheelchair for their mobility needs and the second study comparison group

Psychosocial Measure	ALL (n=247)	NVWG/WSC (n=111)	Comparison (n=136)	p-value[1]
Quality of life				
Physical Health	13.5 (3.1)	14.2 (2.7)	13.0 (3.3)	.095
Environment	15.3 (2.7)	15.4 (2.7)	15.3 (2.8)	.689
Total	61.8 (10.5)	63.6 (9.3)	60.4 (11.2)	.221
CHART				
Physical	77.6 (33.9)	69.8 (42.6)	83.9 (22.8)	.001
Cognitive	81.6 (26.3)	75.7 (32.8)	86.5 (18.0)	.002
Mobility	87.9 (18.0)	92.2 (16.5)	84.3 (18.5)	.026
Occupation	63.8 (32.9)	65.5 (34.3)	62.6 (31.9)	.903
Social	89.0 (20.2)	91.6 (21.2)	86.9 (19.1)	.038
Economic	78.9 (32.4)	81.8 (32.8)	76.5 (32.0)	.391

1. Controlling for disability

Functional Performance and Satisfaction Related to Prostheses Use in Veterans with Lower Extremity Amputation (LEA)

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ABSTRACT: Lower extremity prostheses outcomes are not known in US veterans population. In this study, 46 veterans aged 18-80 years with lower extremity amputation completed the MOTIVATe questionnaire. Demographics, mobility device characteristics, functional performance, and device satisfaction were compared between Prosthetics and Wheelchair Group. Wheelchair Group, were older veterans with more comorbidity, higher levels of bilateral vascular amputations, and significantly more likely to have an SCI (p=0.005), compared to prostheses group. Both groups reported significant use of wheelchairs, with the Wheelchair Group using a greater number of other mobility devices. Prostheses use with ease and level of activities were negatively correlated, with significant association between use and activities like 'in and out of car/bus' (p=0.04) and 'sports activities' (p=0.009). A difference in the satisfaction levels between the two groups was not consistent. Determining long-term outcomes is critical to prosthetics rehabilitation, to maximize prostheses use and abandonment prevention.
KEYWORDS: Lower extremity amputation, prostheses usage and satisfaction

INTRODUCTION: The number of lower extremity amputations (LEA) from combat-related injuries and peripheral vascular diseases has increased in US veterans. The use of prescribed prostheses depends on several factors such as health, characteristics of the prostheses, availability of other mobility devices, and level of daily physical activity. A survey related to utilization of prostheses by US veterans (N=45), indicated that a significant proportion (54%) of the sample population did not consider the devices useful and did not use them for everyday activities, mainly due to discomfort and pain[1]. A study by Dougherty (1999) indicated only 22% of the total study sample population (N=23) used their prostheses for ambulation and those using prostheses reported a significantly lower physical functioning on SF-36 as compared to their able-bodied counterparts [2].

Dillingham et al. (2001) reported, in a sample population of 146 individuals, 95% used their prosthesis on a regular basis, though only 45% of them were satisfied with the device. The study reported a negative relationship between high amputation level and presence of phantom pain to that of non-use and dissatisfaction with prostheses [3]. Pezzin et al. (2004) similarly reported low prosthesis satisfaction despite high usage of prosthetic devices. Problems decreasing prosthesis satisfaction included lack of comfort, communication with professionals, and fitting time [4]. However, most of the previous research has either focused on the elderly with dysvascular amputation or young non-veterans with traumatic amputation. The purpose of this paper is to describe the veterans with LEA attending organized sporting events, and to determine the levels of functional performance and satisfaction related to the prescribed prosthetic devices.

RESEARCH QUESTIONS:
1. What are the demographics and the characteristics of mobility devices used by veterans attending the Winter Sports Clinic (WSC) and National Veterans Wheelchair Games (NVWG)?
2. How do levels of difficulty perceived by the veterans using and not-using prostheses for daily functional activities differ?

3. How do the levels of satisfaction differ between, veterans using their prosthesis as the primary mobility device compare to those using a wheelchair as the primary mobility device?

METHODS: Protocol: The study was a cross-sectional questionnaire-based, entitled Mobility Outcomes and Training In Veteran Adaptive Technology (MOTIVATe), and was a part of the collaborative initiatives between the Human Engineering Research Laboratories (HERL) and the Walter Reed Army Medical Center (WRAMC) Amputee Program. Participants: Forty-six veterans (N=46) with LEA, taking part in, either the 20th National Disabled Veterans Winter Sports Clinic in Snowmass Village, Colorado, or the 26th National Veterans Wheelchair Games, Anchorage, Alaska, participated in the study. Inclusion criteria for the study were: 18 years or older, using AT devices for mobility, and having a LEA. Outcomes: MOTIVATe is an outcomes-based questionnaire, consisting of four components namely: demographics, quality of life, mobility and training. For this paper, data from only the demographic and mobility components of the questionnaires were used. Lower extremity functional performance scale, based on the Orthotics Prosthetics User Survey (OPUS), determined levels of difficulty (1= Very Easy to 4=Extremely Difficult) experienced with use/non use of prostheses for daily activities [5]. Satisfaction levels with prostheses were determined using the standardized satisfaction sub-scale of Trinity Amputation and Prosthesis Experience Scales (TAPES). Participants reported aesthetic, weight, functional, and overall satisfaction with prostheses using 1-5 rating scale (1=Very Dissatisfied and 5= Very Satisfied) [6]. Analysis: The cohort of veterans was divided in two groups as Prosthetics and Wheelchair Groups, indicated by the participants as using prostheses or wheelchairs primarily for mobility. Demographic variables with continuous level of measurements were compared between these groups using independent t-tests, while categorical variables were compared using Fisher's exact statistics. For functional performance, association between use/non-use (1=Use and 0=Non-use) of prosthetic devices and level of difficulties (which was dichotomized to 0=Difficult and 1=Easy), was determined using Fisher's exact statistics. Finally, satisfaction levels between wheelchairs and prosthetics groups were compared using independent t-tests. All the statistical analyses were done using SPSS 14.0, with an α level of 0.05.

RESULTS: Demographics: The Prosthetics Group (N=29) was younger, with less comorbidity as compared with the Wheelchair Group (N=17). A higher percentage of participants in the Wheelchair Group had with non-traumatic (vascular) and bilateral amputation; and higher levels of amputation as compared to Prosthetics Group. The proportion of individuals with upper limb amputation along with LEA was the same in both groups. However, a significantly higher number of individuals had SCI in the Wheelchairs Group compared to the Prosthetics Group (p=0.005).

Insert table 1.

Mobility Devices: A greater number of supplemental mobility devices (canes, crutches, and walkers) were used by participants in the Wheelchair Group, compared to those in the Prosthetics Group. Those in the Prosthetics Group used both manual (69%), and power wheelchairs (11%), which was no different than those used by wheelchairs group (manual=70% and power=30%). However, a very low proportion of participants (18% in both groups) received a formal training in wheelchair propulsion.

Insert table 2.

Functional Performance: More participants reported using prostheses with ease for activities that required less energy expenditure (using toilet=66%) compared to higher energy activities (traversing uneven terrains=25%). Also, for activities like 'getting in and out of car/bus' and 'performing sports or leisure activities', a significant association (p=0.04 and p=0.009) was observed between prosthesis usage and level of difficulty.

Insert table 3.

Satisfaction Related to Prostheses: Though not to a significant degree, higher levels of satisfaction with their prostheses (overall, functional, and weight) were reported by Prosthetics Group participants, compared to those in the Wheelchair Group. However, satisfaction related to appearance of prostheses was non-significantly higher for Wheelchair Group compared to the Prosthetics Group.

Insert table 4.

DISCUSSION: Demographically, participants in the Wheelchair Group were older, with more comorbidity, had higher level bilateral vascular amputation, and a significantly higher frequency of SCI. Previous studies, however, have looked at traumatic and non-traumatic amputee population separately and has not compared prostheses vs. wheelchair use[2-4]. Participants also reported using wheelchairs along with prostheses; however, use of canes, crutches and walkers was greater in the Wheelchairs Group compared to the Prosthetics Group. These finding are consistent with previous studies that determined a significant number of their sample population used other mobility devices along with or in lieu of prosthetic devices[3, 4]. Though a significant proportion of the veterans with LEA population used manual wheelchairs, very few of them actually received formal training in wheelchair propulsion, which could lead to some unintentional secondary injuries. Previously, a study reported lower physical functioning in individuals with bilateral transfemoral amputation using prostheses, as compared to their able-bodied counterparts. However, our study found a negative relationship between the use of prostheses with ease, and the level of difficulties in performing daily activities. Unlike previous studies[1, 3, 4], participants from this study reported higher level of satisfaction with use of prostheses as compared to the non-use group. Therefore, a generalized relationship cannot be established between use and satisfaction. Convenience, small sampling of athlete veterans and reporting bias are some of the limitations of this study. However, results from the study indicate a need for long-term follow up to determine interchangeability between various mobility devices, and to identify factors affecting choice of one device along with or in lieu of the other for performing daily activities with less energy expenditure. These factors, when taken in consideration, could maximize prostheses usage and prevent non-usage or abandonment of the prescribed prosthetic technology.

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Table 1. Demographic Variables

Variables		Prosthetics Group (N=29)	Wheelchairs Group (N=17)	Significance (p)
Age		40.58±17.14	48.18±12.45	t (p=0.09)
Gender	Male	28	15	NA
	Female	1	2	
Ethnicity†	White	22	11	NA
	Non-White	7	5	
Amputation Years		13.78±16.10	12.57±12.06	t (p= 0.80)
Comorbidities		1.16±1.27	1.78±1.97	t (p= 0.30)
Amputation Reason†	Traumatic	23	10	X^2 (p= 0.09)
	Non-Traumatic	4	6	
Side Involvement†	Unilateral	20	8	X^2 (p= 0.07)
	Bilateral	5	7	
Amputation Level†	Hip Disart.	2	2	NA
	Transfemoral	5	9	
	Knee Disart.	3	0	
	Transtibial	16	3	
	Foot Amputation	0	1	
Upper Limb Amputation	Yes	5	3	X^2 (p= 0.63)
	No	24	14	
SCI	Yes	0	5	X^2 (p= 0.005)*
	No	29	12	

†= Missing Values, t= Independent t test, X^2 = Fisher's's Exact statistics, NA= Not Applicable *= Statistically significant difference at α=0.05

Table 2. Mobility Devices Characteristics

		Prosthetic Group	Wheelchair Group	Significance (p)
Manual Wheelchairs	Yes	20	12	X^2 (p=0.59)
	No	9	5	
Power Wheelchairs	Yes	3	5	X^2 (p=0.10)
	No	26	12	
Manual & Power Wheelchairs	Yes	3	4	X^2 (p=0.21)
	No	26	13	
Other Mobility Devices		0.74±0.81	0.94±1.08	t (p=0.48)
Manual Wheelchairs Skills Training	Yes	5	3	X^2 (p= 0.63)
	No	24	14	

t= Independent t-test, X^2 = Fisher's's Exact statistics

Table 3. Functional Performance

		Difficulty in Use	Ease in Use	Significance (p)
Using Toilet	Prosthetics Non-Use	2	7	X^2 (p= 0.94)
	Prosthetic Use	2	21	
Walking Two Blocks	Prosthetics Non-Use	1	9	X^2 (p= 0.08)
	Prosthetic Use	9	13	
Using Ramp	Prosthetics Non-Use	3	6	X^2 (p= 0.15)
	Prosthetic Use	14	9	
In/Out of Car/Bus	Prosthetics Non-Use	0	8	X^2 (p= 0.04)*
	Prosthetic Use	9	14	
Going to Movie/Theater	Prosthetics Non-Use	1	7	X^2 (p= 0.59)
	Prosthetic Use	4	18	
Carrying 10lbs (Shopping)	Prosthetics Non-Use	1	8	X^2 (p= 0.23)
	Prosthetic Use	7	15	
Walking Uneven	Prosthetics Non-Use	5	4	X^2 (p= 0.48)

		Difficulty in Use	Ease in Use	Significance (p)
Terrains				
	Prosthetic Use	14	8	
Navigating Through Crowd	Prosthetics Non-Use	3	6	X^2 (p= 0.15)
	Prosthetic Use	14	9	
Extreme Weather Conditions	Prosthetics Non-Use	3	6	X^2 (p= 0.11)
	Prosthetic Use	13	7	
Sports/Leisure Activities	Prosthetics Non-Use	0	9	X^2 (p= 0.009)*
	Prosthetic Use	10	10	

X^2 = Fisher's's Exact statistics, *= Statistically significant difference at α=0.05

Table 4. Satisfaction Related to Lower Extremities Prostheses

	Prosthetic Group (mean ± sd)	**Wheelchair Group** (mean ± sd)	**Significance (p)**
Aesthetic Satisfaction	14.40±4.20	14.72±4.84	t (p=0.83)
Weight Satisfaction	3.72±1.34	3.55±1.37	t (p=0.72)
Functional Satisfaction	18.52±4.57	17.63±5.22	t (p=0.61)
Overall Satisfaction	3.76±1.05	3.55±1.21	t (p=0.59)

t= Independent t test