COLLEGE OF HEALTH, PHYSICAL EDUCATION,
RECREATION, AND TEACHER EDUCATION

UNIVERSITY OF WISCONSIN-LA CROSSE

THESIS FINAL ORAL DEFENSE FORM

Candidate: Jessica Ann Evel

We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the degree:

Master of Science in Exercise and Sport Science-Physical Education Teaching

The candidate has successfully completed the thesis final oral defense.

Jeffrey Paul Stuhr — July 5, 2000
Thesis Committee Chairperson Signature — Date

Sandi Anderson — July 5, 2000
Thesis Committee Member Signature — Date

Gregory M. Wahlen — July 5, 2000
Thesis Committee Member Signature — Date

This thesis is approved by the College of Health, Physical Education, Recreation, and Teacher Education.

Sandi Anderson — July 31, 2000
Associate Dean, College of Health, Physical Education, Recreation, and Teacher Education — Date

R. Daniel Mayeux — 8-22-00
Dean of Graduate Studies — Date

ABSTRACT

EVEL, J. A. A comparison of heart rates of middle school students with and without cognitive disabilities during a challenge course experience. MS in Exercise and Sport Science-Physical Education Teaching, August 2000, 47 pp. (J. Steffen)

This study was designed to determine if students with cognitive disabilities (CD) would respond physiologically the same as students without CD while participating on a challenge course. The sample included 38 male and female Ss with 17 representing the group with CD and 21 without CD. Subjects were middle school students from the La Crosse School District. Subjects completed one trial on one high element at the University of Wisconsin-La Crosse's indoor challenge course. Heart rate monitors collected heart rates during three phases: pre-climb, climb, and post-climb. Resting heart rates were taken prior to the Ss's arrival at the challenge course. Means and standard deviations of all phases were calculated and compared between the groups. Results of a one-way ANOVA indicated no significant ($p > .05$) difference between the overall heart rates of the two groups. A significant difference ($p < .05$) was found within-subjects between phases and groups. The results of this study seem to indicate that there were similar effects on heart rates of students with and without CD on a challenge course. Facilitators need to be equally concerned with HR increases between pre-climbing and climbing experiences in participants with and without CD.

A COMPARISON OF HEART RATES OF MIDDLE SCHOOL STUDENTS WITH AND WITHOUT COGNITIVE DISABILITIES DURING A CHALLENGE COURSE EXPERIENCE

A THESIS PRESENTED

TO

THE GRADUATE FACULTY

UNIVERSITY OF WISCONSIN-LA CROSSE

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE

MASTER OF SCIENCE DEGREE

BY

JESSICA ANN EVEL

AUGUST 2000

ACKNOWLEDGEMENTS

I would like to thank the following individuals for all the time they put into making this project happen. The support I received from all of you is greatly appreciated.

First of all, Dr. Jeff Steffen, for his direction he has given me not only for this project, but in everything for the past couple years. Your motivation, energy, and positive character have had a huge impact on my life. Also, for all the patience you have had with me during our outdoor adventure experiences and chapter four! Dr. Mandi Anderson, thank you for our endless conversations and all your good tips on how to arrange those sentences! Dr. Walsko, thank you for your advice and enthusiasm about my topic. I also would like to thank Dr. Carl Foster for helping me with my favorite part of this project - the statistics!

This project wouldn't have been possible without all the help I received from the following people during data collection: Laura, Mindy, RJ, Rav, Kirsten, Heidi, Jo Ann, Tim, and Chris Dodge. A big thanks goes out to Brian Oberweiser for always staying positive and helping me jump through all the hoops! To Bev and Rach for their critical eyes on such short notice!

Thanks to my veteran friends Jeremy and Mark for their humor and words of encouragement. Lastly, to Jeff Cyr, thanks for always waiting so patiently when I got to the door one minute earlier than you! Thank you for all your help and all the jokes and craziness you brought to our hard-working atmosphere.

TABLE OF CONTENTS

CHAPTER

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

Challenge courses, also referred to as ropes courses, are becoming increasingly popular with all populations. Accessible challenge courses are being built all across the nation to accommodate individuals with disabilities (Havens, 1992). Out of the 102 challenge course facilitators in the nation surveyed by Reader (1996), 80% of them have had a person with a disability participate on the course. With this in mind, challenge course facilitators need to increase their knowledge of dealing with special populations. No previous studies were located on the physiological effects challenge courses have on individuals with cognitive disabilities (CD). Due to this lack of information, facilitators may be unaware of proper implementation of a challenge course program for students with CD. Of the subjects responding to Reader's (1996) survey of universality, only 35.3% indicated that they had comprehensive information on people with disabilities. It was found that 59.8% of the respondents did not have specific information in their manual for facilitating people with disabilities.

As a population, individuals with mental disabilities on the average have lower fitness levels than the population without disabilities (Fernhall et al., 1996; Shepard, 1990; Watkinson & Koh, 1988; Winnick & Short, 1985). Studies have found that individuals with lower fitness levels have responded physiologically differently than those with higher fitness levels on a challenge course (Bunting, 1995; Bunting, Little, Tolson & Jessup, 1986). No research was located on whether lower fitness levels that are typical in the majority of students with CD will have an effect on their heart rate (HR) response to challenge course activities.

Understanding how individuals with CD physically respond to challenge course activities may help facilitators with proper implementation of activities.

Purpose of the Study

The primary purpose of this study was to compare heart rates (HRs) of students with and without CD during an indoor challenge course. The secondary purpose was to look for differences during pre-climb, climb, and post-climb phases of the experience.

Need for the Study

Challenge courses are becoming increasingly popular for students and adults of all ages and abilities. Limited research is available on the physiological effects of challenge courses. Previous studies on HRs of corporate groups (Priest & Montelpare, 1995) and college-aged students (Little, Bunting, & Gibbons, 1986; Watts et al., 1999;) have been done. No previous studies were located regarding physiological effects of students with disabilities on challenge courses. There is also a lack of research on elementary and middle school students participating on a ropes course. This study will give facilitators descriptive, baseline data on physiological responses of students with CD participating on a challenge course. The findings of this research will show facilitators if ropes course programming should be altered for students with CD. By using HRs as the measuring factor, facilitators will be able to determine whether intensity levels during participation in challenge courses need to be adjusted to accommodate individuals with disabilities.

Hypotheses

The following null hypotheses were tested in this study:

1. There will be no significant difference in HR responses between students with and without CD on an indoor challenge course.
2. There will be no significant difference in HR responses between students with and without CD during the pre-climb phase.

3. There will be no significant difference in HR responses between students with and without CD during the climb phase.
4. There will be no significant difference in HR responses between students with and without CD during the post-climb phase.
5. There will be no significant difference in HR responses between groups by phases.

Assumptions

The following assumptions were necessary for this study:

1. The Polar Vantage XL Heart Rate Monitors (HRMs) were an accurate tool in measuring HRs.
2. Students at Longfellow and Logan Middle Schools were representative groups of students with and without CD for the La Crosse School District.
3. Resting HRs taken at the schools were an accurate reading of the students' true resting HR.
4. The researcher accurately recorded the times with the phases.

Delimitations

The following delimitations were recognized in this study:

1. Subjects were 6th-8th grade male and female students from Longfellow and Logan Middle Schools in La Crosse, WI.
2. Resting HR data were collected at Longfellow and Logan Middle Schools.
3. Students with and without CD were tested on separate days.
4. Three distinct phases were used for averaging HR data.
5. There was no time limit on Phase II.
6. Subjects with CD were students identified by the La Crosse school district as such.

Limitations

The following limitations were considered in the study:

1. Subjects may have had prior experience on a challenge course.
2. Heart rates could be affected by an outside source such as medicine, food, or drink.
3. The subject's chest strap may fall while participating in the activity.
4. At least some students had previously worn HRMs.
5. Students with CD might have other categorical disabilities also.
6. Fitness levels of the subjects may have hindered performance.

Definition of Terms

The following terms were used in this study:

Belayer - the person at the end of the rope who protects, catches, or lowers a climber (Rohnke, Tait, & Wall, 1994).

Belaying - a technique that protects a climber by use of ropes, carabiners, cable, and belay devices (Rohnke et al., 1994).

Challenge course - an experiential adventure program that offers groups and individuals the opportunity to participate in a series of activities involving mental, physical, and emotional risk-taking in a safe and controlled environment (Rohnke et al., 1994).

Cognitive disability - disabilities characterized by significantly subaverage intellectual functioning (scoring 85 or below on a standard intelligence test) existing concurrently with related limitations in two or more of the following applicable adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure, and work (Foegen, 1998).

Heart Rate - the number of heart beats per minute as measured by the Polar Vantage XL HRMs.

Heart Rate Monitor - a device consisting of a wristwatch and a chest strap containing electrodes that is used to measure HR (Polar, 1993).

Phase I (pre-climb) - the first phase of data collection when subjects were tied into the rope and were given instructions about the activity; this phase lasted a minimum of 3 minutes.

Phase II (climb) - the second phase of data collection from the time the subject began climbing until the subject was ready to be lowered to the ground.

Phase III (post-climb) - the last phase of data collection which began at the time the subject was lowered from the cargo net until 2 minutes after the subject reached the ground.

Resting Heart Rate - the number of times the heart beats per minute while sitting still and not being physically or emotionally aroused.

CHAPTER II

REVIEW OF RELATED LITERATURE

Outward Bound

Adventure education has its roots traced back to the World War II era. The development of adventure philosophies is credited to Kurt Hahn, the founder of Outward Bound (OB) in 1941 (Miner, 1990). After Hahn opened his first school in Germany, the Nazi movement grew. Due to Hahn's anti-Fascist educational beliefs, he was imprisoned by Hitler. After Hahn's release from prison, he traveled to Great Britain where he met Lawrence Holt and began an educational course for training seamen for survival during the war. In these courses, students learned to experience challenges in a natural setting, similar to what they might be exposed to at sea. These experiences allowed the students to develop feelings of self-worth and human interdependence, while developing a concern for others in danger or need. After completing the course, individuals were more prepared for the challenges they would meet at sea.

Hahn's beliefs of developing an individual who is compassionate and an active citizen continued in practice with his school even after the war (Richards, 1990). His ideas evolved into new schools in new areas of the world. Hahn believed that "no student should be compelled into opinions, but it is criminal negligence not to impel him into experience" (Greene & Thompson, 1990, p. 8). These ideas and concepts are still upheld in America through OB schools. Learning about oneself and the world through adventure and service activities are still major goals of the OB program (Greene & Thompson, 1990). The program also stresses character building by using the wilderness as a classroom, a replica of Hahn's programs. Currently, OB offers adventure experiences

across America such as climbing, mountaineering, backpacking, and wilderness survival. Along with the technical aspects of these trips, individuals are faced with exploring the unfamiliar "while searching for an opportunity to understand, test, and demonstrate their own resources" (Greene & Thompson, 1990, p. 6). Invaluable life lessons are learned by participants. They learn to share, to lead, to follow, and how to work as a team to achieve a specific goal.

Another element brought to America from the OB program in Great Britain was obstacle courses. Obstacle courses were also used to train seamen during the war for possible obstacles they might encounter (Priest & Gass, 1997). The obstacle courses of today are now called challenge courses or ropes courses.

National Outdoor Leadership School

An organization that developed from OB was the National Outdoor Leadership School (NOLS). Paul Petzoldt was a mountaineering instructor at the Colorado OB School when he decided that a program to train leaders needed to be developed. He wanted a program for individuals who had already participated in OB and were interested in progressing into leading groups in the wilderness (Bachert, 1990). He began the first NOLS in 1965 in Lander, Wyoming, and programs like this one still exist across the United States today. The four objectives for NOLS courses are leadership development, outdoor skills, minimum impact conservation techniques, and expedition dynamics. NOLS also stresses the transfer of skills from the mountains to ordinary life. Two of these skills include problem solving and decision-making. Individuals involved in a NOLS course learn things by practicing and doing them, not just by talking about them.

Wilderness Education Association

Another organization that has roots traced back to OB is the Wilderness Education Association (WEA). The WEA was responsible for designing a curriculum to develop

standards for certification of wilderness leaders. Petzoldt led the association in wanting to improve the quality of outdoor wilderness experiences for participants. In order to provide quality experiences, guidelines for the wilderness leaders needed to be developed. Petzoldt and other wilderness leaders wanted to make sure groups were safe while providing little impact on the environment (Lupton, 1990). The WEA developed three levels of certification: skills, leadership, and instructor. The skills level certified people to go into the wilderness with a group; the leadership level certified people to lead a group in the outdoors; and the instructor level qualified individuals to teach others about outdoor skills. WEA still exists today as a professional organization promoting survival of the wilderness and safe, ethical wilderness leaders.

Project Adventure

The third organization born as a result of OB is Project Adventure (PA). PA started as a program on how to mainstream the OB mission and principles into a high school setting (Prouty, 1990). Jerry Pieh, principal of Hamilton-Wenham Jr./Sr. High School in Hamilton, Massachusetts, and Gary Baker, a colleague of Pieh's, worked together to develop a proposal on how to bring OB strategies into the high school. With the help of OB staff members, Karl Rhonke, and Bob Lentz, who became its first director, the PA program got under way at the school. A curriculum was developed in which PA strategies overlapped with the regular classes such as biology, social studies, and English. The bulk of this curriculum, however, was designed for a tenth grade physical education class. In this class, goals for the students were to develop interpersonal and intrapersonal relationships. Interpersonal relationships included communication, cooperation, trust, conflict resolution, problem-solving, and leadership influence. Intrapersonal relationships included self-concept, spirituality, confidence, and self-efficacy.

PA recognized the need for self-concept improvement for every population. A class was also developed at Hamilton-Wenham Jr./Sr. High School for students with special needs. No assessment took place as a pre-requisite for students to enter this class, but quiet referrals were made so that students experiencing some troubles in school were included.

PA is one of the leading specialists in the adventure field today. It is known for helping consult, train, and empower others to start, maintain, and improve PA program models (Prouty, 1990). PA is well known for the construction of challenge courses and for developing guidelines for the key elements in an adventure program. Growth in adventure has moved to four major models. These models are (a) adventure programming for physical education and recreation, (b) adventure-based counseling for therapeutic programs, (c) academic programming for classroom academic programs, and (d) staff development programming for educational and corporate adult training. PA still upholds the values of interpersonal and intrapersonal relationships in all their programs.

Challenge Courses

Challenge courses were first brought to America by Kurt Hahn and OB in the 1960s. The obstacle courses used in Great Britain by Hahn for training seamen were the first challenge courses. Since then, challenge courses have become much safer, more detailed, and constructed with different materials. The very first ropes course in America was constructed at the first OB school in Colorado (Rohnke et al., 1994).

Darst and Armstrong (1980) define a ropes course as a series of obstacles designed to present a challenge with a degree of controlled risk. These obstacles are constructed of ropes, cables, trees, ladders, cargo nets, swings, tires, and rings. Participants engage in climbing, balancing, swinging, jumping, crawling, and walking on or over these obstacles. These obstacles can be set between trees, but a more advanced

way of developing courses is the use of utility poles. The use of utility poles versus trees allows for more sites because the construction doesn't depend on the availability of living trees.

Ropes courses offer individuals and groups the opportunity to participate in a series of sequenced activities that involve physical, mental, and emotional risk-taking (Rhonke et al., 1994). Participants take part in games and activities to help develop communication, cooperation, trust, and problem solving abilities with their group and themselves. Before moving onto low element initiatives, groups must demonstrate the aforementioned values. After completing the low elements, participants are able to climb to the high elements. After completing a course, most individuals will feel a sense of accomplishment and self-worth from attempting and/or succeeding at both group and individual challenges (Rhonke et al., 1994).

PA defines the following learning goals for a ropes course curriculum: (a) to increase the participant's sense of personal confidence, (b) to increase mutual support within a group, (c) to develop an increased level of agility and physical coordination, and (d) to develop an increased joy in one's physical self and in being with others (Rhonke, 1984). By attempting activities that involve physical and emotional risk in a safe environment with support from others in the group, participants may begin to develop true self-esteem. A ropes course is not always about succeeding. Much is learned about oneself and the group when failure does occur. However, more important than success and failure is the process and the effort. Debriefing and discussing what occurred during activities help to shape the values and goals a program is trying to accomplish. Tying events that occur during the adventure program to real life situations allows for a transfer of the skills and values of the program. For example, Rhonke (1984) presents an initiative called "all aboard." During this activity the group must figure out how to get all

the participants onto one tarp without anyone touching the ground. After each successful time, the tarp gets smaller so as to challenge the group more. Upon completion of this activity, the group would discuss what helped them be successful or unsuccessful. The comments of the group would lead into a discussion of how these values could be used in a real life setting such as school or work.

Challenge courses also offer opportunities for improving physical abilities such as balance, coordination, and agility. Improvement of these skills often generates a feeling of personal worth. Along with the previous mentioned benefits of a challenge course, a program must be fun. Participants need to experience joy, laughter, and anticipation (Rhonke, 1984).

Adventure Education in a Physical Education Curriculum

Trends in physical education (PE) continue to change. PE curricula have seen emphasis change from team sports and individual sports to health-related fitness and lifetime sports. In the past, lifetime sports have included activities such as golf, tennis, and archery. Today's lifetime sports include low, medium, and high risk adventure activities such as orienteering, backpacking, and rock climbing, respectively (Latess, 1986). The question arises whether these risky adventure activities should be included in a PE and school curriculum. Latess (1986) states that adventure programs enhance a PE program. The needs of more students are met. The varsity athletes are not the only ones benefiting in the PE program. Teamwork is stressed through cooperative activities rather than competitive sports. Students of all abilities are able to participate at their own level of challenge. A main goal of physical educators is to get students to participate in life long physical activity. The wave of the future are activities such as biking, canoeing, and rock climbing. In order for students to be introduced to and learn about new activities, physical educators must provide the opportunity during PE classes.

Darst and Armstrong (1980) state the goals of PE as the development of fitness, motor abilities, mental abilities, and social-emotional abilities. Adventure programs including challenge courses achieve these goals (Ewert, 1986). Providing noncompetitive, personal growth activities in a small group context is the growing trend in society. Addressing the needs of today's students is a necessity when developing a PE curriculum (Mensch, Onuschak, & VanDriel, 1995). Middle and high school students seek challenge that involves risk. Providing an environment where the risk is controlled and supervised, with a developmental curriculum that teaches the students safety and trust will satisfy their desire for risk taking.

In a response to a discussion printed in JOPERD, Miller stated the opinion that "today's students are in the need of developing positive self-image and confidence in their ability to be successful" (Miller, 1995, p. 9). Learning to face challenges with positive decisions is an important life skill students need to learn. Being able to set goals and see the progressive steps towards the goals helps students experience success. Students need to learn to share ideas, trust one another and cooperatively work towards succeeding at a goal. These are all concepts that a sequenced adventure program with accomplishes. Rohnke (1986) states that education of the total person takes place in an adventure program.

History of Accessible Adventure and Ropes Courses

Schleien and Ray state (as cited in Havens, 1992) that adventure education for people with disabilities first began in the 1900's as segregated camping and outdoor recreation experiences. Between the 1940s and 1970s, the establishment of organizations, such as the Paralyzed Veterans of America, National Wheelchair Athletic Association, and the North American Riding for the Handicapped Association, has been the key to opening up doors in the adventure arena for persons with disabilities. Federal

funding for programs in the 1970s and national conferences and workshops on outdoor recreation with persons with disabilities in the 1980s have continued to help this adventure avenue grow (Havens, 1992).

In the early 1960s, OB expanded its adventure programs to include courses for delinquent youth (Sugarman, 1988). The positive outcome of these programs on the youth was apparent and, therefore, the program was expanded to include other special populations. In 1977, the Tree Climb Program was implemented at Bradford Woods in Marinsville, Indiana; Camp Millhouse in South Bend, Indiana; and several other outdoor camps and programs for individuals with disabilities (Havens, 1992). The Tree Climb Program consisted of a high platform in a tree that was used as a beginning adventure experience for individuals with disabilities. As a result of this program, Havens and Roland, with the help of persons with disabilities, designed and built the first accessible challenge course in Loretto, Minnesota. This course was just the beginning of the movement to make ropes courses accessible across the nation.

Rationale for Accessible Adventure for Students with Cognitive Disabilities

The Americans with Disabilities Act (ADA) P.L. 101-336 (1990) states that no individual can be discriminated against on the basis of disability and that equal enjoyment of goods, services, facilities, privileges, advantages, and public accommodations must be granted (Sugarman, 1993). Therefore, all adventure programs must meet these federal requirements and have accessible facilities and programming for persons with disabilities. Ropes courses are specifically mentioned as facilities required to be accessible. Every citizen has the right to access community services and adventure programs are one of these services. Public Law 94-142, Education for all Handicapped Children Act (1975) ensures free and appropriate education for all children with disabilities (Havens, 1992). Legislation will continue to undergo change and adventure leaders and educational

programs must be aware of the responsibility they have to include individuals of all abilities.

In her critical review of literature, Sugarman (1988) cites Dillenschnedier when she states social isolation, low self-esteem, and an increased need for leisure skill development are three conditions that individuals with cognitive disabilities face. Self-concept of an individual with a mental disability depends more on social experiences than on cognitive development. Adventure education emphasizes and promotes growth of socialization, self-esteem, and leisure skill development while developing group support and cooperation. Taking risks and succeeding provides a positive feeling of accomplishment. Students with a cognitive disability most often have Individualized Education Plans (IEP) at their schools. Participation in an adventure program and ropes course can positively work towards achieving IEP goals such as socialization, spatial awareness, auditory skills, fine and gross motor skills, balance, flexibility, strength, coordination, and endurance (Roland, 1982; Sugarman, 1988).

Including students with any type of disability fosters the growth of interpersonal relationships between students with and without disabilities (Roland & Hancock, 1984). Nondisabled persons also benefit by integrating persons with disabilities (Havens, 1992). "We need to see people with disabilities not as fundamentally different, but as part of a spectrum of physical ability" (Terry, 1995, p. 17). Adventure programs can be a source of breaking stereotypes about students with any type of disability by building communication between all participants. A program is enhanced when individuals from all abilities work together to achieve common goals.

Definition of Cognitive Disabilities

Out of the 40 million people in America that have a disability, 6% have a cognitive disability (Havens, 1992). The term cognitively disabled is a recent term used

by some to describe the same characteristics as those previously labeled cognitively challenged, mentally retarded or mentally challenged. The American Association on Mental Deficiency (AAMD) accepts the definition by H. J. Grossman for mental retardation: mental retardation is defined as significant subaverage general intellectual functioning resulting in or associated with concurrent impairments in adaptive behavior and manifested during the developmental period (Havens, 1992). Subaverage intellectual functioning is measured by an IQ test. An individual's score is compared with the average IQ score of 100. Four categories are used to classify the degree of cognitive challenge. The classification for mild mental retardation is an IQ score between 55 and 70, moderate is between 40-55, severe is between 25-40, and profound is below 25. Persons with mild mental retardation function on a second to fifth grade level and are able to function independently in society. The educational focus for the moderately impaired is the development of life skills. Persons with this classification can work and live in a supervised environment. Those with severe and profound mental challenges are dependent on others for basic needs for their entire lives.

Individuals can also be evaluated on their adaptive behavior to be classified with a mental challenge. Havens (1992) stated that adaptive behavior includes the person's ability to meet standards of maturation, learning, personal independence, and social responsibility that would be expected of another individual of comparable age level and cultural group. Specific assessment tools are used to measure the person's ability to cope with the demands of the individual's environment.

The last part of the AAMD's definition is the developmental period. The developmental period is from birth to eighteen years of age. Slow development of motor and cognitive skills can be a first sign of possible mental retardation (Auxter & Pyfer, 1989). A few characteristics that can be representative of individuals with cognitive

challenges are perceptual attributes that relate to motor skills such balance, postural reflexes, and slower movement time. Individuals with mental challenges have physical and motor delays and tend to have underdeveloped cardiovascular systems with an increased obesity rate. However, not all students with cognitive challenges have motor impairments and delays.

Heart Rate Responses

Heart rates have been the traditional tool used in measuring intensity levels of challenge course activities for participants. Little et al. (1986) measured HR responses of male and female college students on five high ropes course elements using portable HR monitors (HRMs). These researchers found that by participating in a challenge course, an individual can reach a training intensity level at which fitness gains may occur. Maximum HRs of over 200 beats per minute (bpm) were observed. A combination of physical exertion and emotional anxiety contributed to the HR responses.

The population that challenge courses are targeting continues to change (Bunting, 1995). No longer are these courses just for young, healthy, and active people. Corporate groups, at-risk programs, rehabilitation centers, recreation programs, hospitals, and schools are some organizations that make up the current population of people participating in challenge courses. With this change in populations, and therefore, varying fitness levels, information on physiological responses of a more sedentary population was needed. By measuring HRs and other physical measures, Priest and Montelpare (1995) designed a formula to be used to predict highest HRs of male participants. This information can be used when less fit individuals are concerned about the cardiac risk of participating in a challenge course. Highest HRs in this study of a corporate population ranged from 126-197 bpm. Heart rates are of importance, because a rapid increase in them or a high sustained HR can provoke cardiac arrest. The data of

Watts et al. (1999) parallels that of Little et al. (1986) on their findings of maximum HRs over 200 bpm. However, even though the maximum HRs were over 200 BPM, Watts et al. (1999) found the average work level to be comparable to activities such as canoeing, roller/ice skating, and tennis. Thus, the participation on a ropes course is not too physically demanding on healthy individuals.

A comprehensive report of studies completed on physiological measurements of stress during outdoor adventure activities was compiled by Bunting (1995). Of these studies, all but one divided the subjects into a high or low fit group. From these studies, Bunting observed that individuals with low fitness levels had greater increased HR responses to outdoor adventure activities. In the specific study conducted by Bunting et al. (1986), it was found that both pre and post HRs of ropes course participants were higher for low-fit individuals. Rapid and extreme increases in HR occurred with various outdoor adventure activities. Facilitators can use this information to inform participants of the physiological response to challenge courses, so the participants may decide on what level of participation would be best suited for them and their fitness levels. From related literature, Bunting stated that evidence has shown that higher fitness levels may lessen the response to psychological stressors. This may enhance coping efficiencies to the physical and psychological stresses of participation in a challenge course

Fitness Levels

For the most part, the methods in developing fitness in individuals with and without disabilities is more similar than it is different (Winnick & Short, 1985). Both groups have muscles that need to be strengthened, a cardiovascular system that needs to be trained, and a body that needs to meet the demands of sport and recreational activities and daily living. Even though both populations require similar programming to be healthy, fit individuals, opportunities and programs for physical activity are less available

for individuals with disabilities. The lack of opportunity and experience in physical activities may lead to sedentary life styles that lead to lower fitness levels in students with mental disabilities (Stein, 1965). Fernhall completed a study in 1991 that found peak HRs to be 8-30% lower in individuals with mental disabilities compared to age predicted norms (Fernhall et al., 1996). As a population, individuals with mental disabilities have lower fitness levels than individuals without mental disabilities. (Fernhall et al., 1996; Shepard, 1990; Watkinson & Koh, 1988; Winnick & Short, 1985). However, it has been found (Fernhall et al., 1995; Stein, 1965) that some students with mental disabilities do achieve average, age-predicted norms for fitness levels.

Physical Activity and Recreation

Sedentary lifestyles can lead to obesity and health concerns (Seaman, Corbin, & Pangrazi, 1999). By participating in physical activity, individuals with disabilities can, for the most part, gain similar benefits in physical fitness as individuals without disabilities. Winnick and Short (1985) reported that individuals with disabilities may have to start fitness programs at lower levels of intensity due to the typically lower fitness levels of this population. These researchers also state that fitness programs must be fun in order to maintain interest and involvement.

To gain health benefits, one does not need to partake in strenuous activity (Seaman et al., 1999). As demonstrated by Bunting et al. (1986) and Watts et al. (1999), participation in a challenge course is a form of moderate physical activity. Challenge courses are a non-traditional and relatively new activity for most individuals with disabilities. According to Winnick and Short (1985), persons with disabilities are more likely to engage in physical activity if participation takes place with a peer or within a group. Rohnke et al. (1994) define one goal of a ropes course program to be the attempt to work as a team. With this in mind, a challenge course is a good place for students

with disabilities to engage in physical activity while working with friends.

Summary

Outdoor recreation appeals just as much to individuals with disabilities as it does for persons without disabilities (Farbman & Ellis, 1987). Individuals with disabilities oftentimes need to be more concerned about participating in physical activity due to their sedentary lifestyles. Offering nontraditional activities for participation such as challenge courses may encourage this population to be active. Increased opportunities and knowledge of available outdoor activities may help to encourage healthy choices that individuals with disabilities make about leading an active lifestyle.

Federal laws, set forth by the Americans with Disabilities Act, mandate the equal treatment of individuals with and without disabilities. Because of the laws, recreational facilities must be equally available and accessible for persons with disabilities. One part of making ropes courses accessible is the knowledge of programming techniques used for individuals with disabilities (Reader, 1996). Farbman and Ellis (1987) stated that one issue in developing program accessibility is to educate staff members about accessibility options. Previous studies on responses of individuals with CD on ropes courses were not located. Knowledge of the responses of these individuals both psychologically and physiologically is important to create accessible and safe environments for all participants.

Physiological data are available on regular populations' responses to challenge courses. To continually include all populations in challenge course activities, it is beneficial to obtain descriptive, baseline data on all populations. It is not known if students with CD will respond physiologically different than their peers without disabilities on challenge course activities.

CHAPTER III

METHODS AND PROCEDURES

Introduction

The purpose of this study was to compare HRs of students with and without CD during participation on an indoor ropes course. Heart rates of middle school aged students with and without CD were measured during one session on the University of Wisconsin-La Crosse's indoor challenge course. Heart rate results from three distinct phases, pre-climb, climb, and post-climb, were averaged and then compared between the two populations.

Subject Selection

The subjects with CD were students from Longfellow and Logan Middle Schools in La Crosse, WI. All male and female students in grades 6th-8th who were identified as CD by the school district were asked to participate in the study. The school district's definition of CD is "disabilities characterized by significantly subaverage intellectual functioning (scoring 85 or below on a standard intelligence test) existing concurrently with related limitations in two or more of the following applicable adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure, and work" (La Crosse School District Handbook, 1998). Parent permission was granted for 23 of the students. Due to incomplete data on 6 subjects, only 17 subjects with CD were used in the data analysis. This group consisted of 11 males and 6 females. The second group consisted of 12 male and 10 female students without disabilities in 7th grade from Longfellow Middle School. Due to incomplete data on one male, only 21 subjects' data were analyzed. Two seventh

grade classes were chosen by Longfellow teachers to make up the subject population without CD. Within these two classes, 22 students were randomly chosen by their teachers from their respective class lists to participate in the study. The first half of the class list for the males was chosen to participate, and every third name on the girls' class list was chosen to participate.

Resting Heart Rates

Resting HRs were taken at each subject's respective school, Longfellow or Logan Middle School. Resting HRs were measured by Polar Vantage XL HRMs. The monitors consisted of a transmitter placed around the chest and a watch placed on the wrist. The researcher was responsible for placing the monitors on each subject and recording the data. Data were recorded after the subjects were sitting quietly for 2 minutes in an upright position.

Testing Procedures

Prior to beginning the study, approval was granted from the University of Wisconsin-La Crosse Institutional Review Board and the School District of La Crosse Research and Development Committee. Subjects filled out an informed consent form (see Appendix A), an assent form (see Appendix B), and a UW-La Crosse Adventure Program Health and Liability form (see Appendix C) before participating in the study.

Data collection took place at UW-La Crosse's indoor challenge course. Subjects participated in one climbing session. A climbing session consisted of the students climbing as high as they felt comfortable. There was no maximum or minimum time limit for climbs. Students with CD participated on a separate day from the students without disabilities. Heart rates were measured with the Polar Vantage XL HRMs. Students were assisted in putting the HRMs on by a trained adult prior to their climb. The researcher was responsible for starting and stopping the HRMs.

One student at a time took part in the high challenge course element. The challenge for the student was to ascend a cargo net that led to a suspended swinging log (see Appendix D). Each student was required to wear a seat harness and a helmet. The seat harness was connected to a safety rope and was managed at all times by a trained UW-La Crosse Adventure Program staff member. The UW-La Crosse staff member was responsible for protecting, catching, and lowering subjects by use of the safety rope.

Heart rates were measured at 5-second intervals during three distinct phases, pre-climb, climb, and post-climb. Phase I took place while the subjects were being tied into the safety rope and discussing safety procedures. This phase had a minimum time limit of three minutes. Phase II consisted of the subjects climbing the cargo net and traversing the swinging log. There was no time limit for this phase. Phase III began when the subjects were lowered to the floor and were being untied from the safety rope. The subjects' HR data were collected for an additional two minutes after reaching the ground while the subjects remained standing.

Because of the various ability levels, subjects were not required to reach a specific height. The rationale for this was that different students are challenged at different levels. One student may only make it halfway up the cargo net, while another student would make it to the top. Making it halfway is a great accomplishment and challenge for some participants. A successful participation does not mean one must make it to the top.

After the data were recorded by the HRMs, they were downloaded onto the computer using the Polar HRM program. Data were immediately printed out in hardcopy form. The hardcopy consisted of the subject's HR data printed out in a listed format every 5 seconds during all three phases. During the participant's climb, the researcher's assistant was responsible for writing down corresponding times of each phase through the use of a stopwatch. The data from the print-out were then matched with the

corresponding times of the pre-climb, climb, and post-climb to specify where each phase began and ended on the print out.

Statistical Treatment

Means and standard deviations were computed for HRs of subjects with CD and without CD for the resting phase, pre-climb phase, climb phase, and post-climb phase. A one-way ANOVA using repeated measures was used to determine whether significant differences existed between HRs of students with and without CD during the resting, pre-climb, climb, and post-climb phases. Alpha level of confidence was set at .05.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

This study compared HRs of students with and without CD in the La Crosse school district during participation in an indoor ropes course. This chapter presents the results and discussion of the following data: (a) biographical characteristics, (b) means and standard deviations of HRs, (c) a graphical description of the two groups' HRs, and (d) ANOVA results for HRs by group. The .05 level of significance was used for all statistical calculations.

Biographical Characteristics

Thirty-eight subjects in 6th through 8th grade participated in the study. Seventeen were categorized as CD and 21 were not CD. All subjects were volunteers from Longfellow and Logan Middle Schools in La Crosse, Wisconsin. The Non-CD group originally consisted of 22 and the CD group of 23 subjects, but due to incomplete data for 7 of the subjects, the subjects were dropped from the study.

Means and Standard Deviations of Heart Rates

Means and standard deviations of HRs for individual phases are presented by groups in Table 1. Non-CD subjects had a mean resting HR of 86.7 bpm. CD subjects had similar mean resting HRs of 93.7 bpm. HRs for phases 1-3 appear to be similar in Non-CD and CD students. A mean max HR of 189.5 bpm was found for Non-CD students.

Table 1. Means and Standard Deviations of Heart Rates for CD and Non-CD Subjects

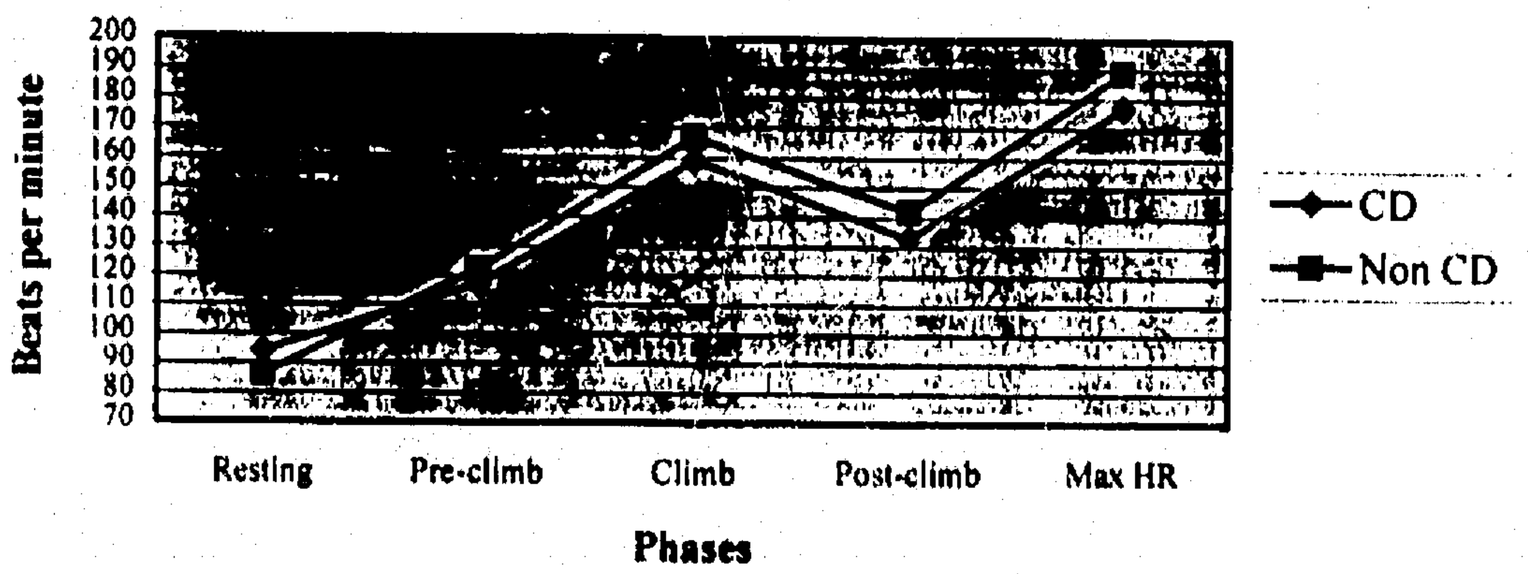
Group	n	Resting	Pre-climb	Climb	Post-climb	Max
CD	17	93.7 *	115.8	157.8	131.4	175.7
		13.8**	13.3	20.1	17.9	20.3
Non-CD	21	86.7 *	122.4	170.5	142.7	189.5
		12.0**	16.2	15.9	16.9	14.0

* = Mean ** = Standard Deviation

Graphical Description

Figure 1 depicts the graph of HRs of students with and without CD. The graph shows an apparent interaction occurring for the CD and Non-CD groups between the resting phase and the pre-climb phase. A similar effect on heart rates can be seen for both groups for the pre-climb, climb, and post-climb phases.

Figure 1. Graphical Description of the Heart Rates throughout the Phases



Analysis of Heart Rates by Group

The results of a one-way ANOVA with repeated measures are presented in Tables 2 and 3. An ANOVA was used to determine any significant difference in HRs between students with and without CD across the resting HR phase, pre-climb phase, climb phase, and post-climb phase. Table 2 shows the results of the main effects of heart rates for students with and without CD across the phases. With sphericity assumed, the F ratio (F = 297.2) for the main effect of phases and for phases by group showed significant differences ($p < .05$). These results indicated that a difference occurred for the groups and trials.

Table 2. ANOVA Table of Main Effects

Source	Sum of Squares	df	Mean Squares	F	Significance
Phases	110097.1	3	36699.0	297.2	.00*
Phases by Group	2645.8	3	881.9	7.1	.00*
Error (Trials)	13336.4	108	123.5		

*Indicates a significant difference ($p < .05$).

Table 3 shows the ANOVA results for three things: (1) the comparison of the CD and Non-CD groups at each phase, (2) the affect that moving from one phase to the next has on overall heart rates, and (3) the comparison of the two groups as they move across

the phases. With sphericity assumed, the F ratio (F = 2,9) indicated that no significant difference ($p > .05$) occurred between the heart rates of CD and Non-CD groups at the resting, pre-climb, climb, and post-climb phases. These results indicate that there was a similar effect on HR of students with and without CD on a challenge course. A significant difference ($p < .05$) in heart rates was found between the phases. With the nature of a ropes course activity in mind, it is expected to see these significant changes in heart rates occur at different phases of a challenge course activity due probably to increases and decreases in physical activity and anxiety. A comparison of groups by phases also found a significant difference ($p < .05$) in heart rates as indicated by the F ratio (F = 10.7). The significant difference occurred as an interaction of the two groups between the resting phase and pre-climb phase. Resting and pre-climb mean heart rates of both groups were similar. Figure 1 shows that the interaction occurred between resting and pre-climb phases.

Table 3. ANOVA Summary Table

Source	Sum of Squares	df	Mean Squares	F	Significance
Groups	1814.9	1	1814.9	2.9	.093
Error	21967.9	36	610.2		
Phases	65671.5	1	65671.5	343.5	.000*
Groups by Phases	2040.3	1	2040.3	10.7	.002*
Error (Phases)	6883.1	36	191.2		

*Indicates a significant difference ($p < .05$)

Discussion

Statistical analysis of heart rates of students with and without CD on a challenge course indicated some significant differences between the groups. The significant difference in heart rates that occurred between the phases was expected. It would be common to see increases and decreases in heart rates during different parts of a challenge course activity. A ropes course can be physically and/or emotionally challenging for individuals. This physical and emotional response to these challenges can differ from person to person, but some type of response usually occurs and could produce changes in HRs. During the pre-climb phase, individuals could possibly experience levels of stress due to their perceived risk of the activity. This perception of risk could increase HRs. The fear factor and the physical strength required in climbing could contribute to raising the HRs during Phase II. Completion of the activity during Phase III could bring about a decrease in HRs due to no longer having to physically exert oneself and the element of fear being taken away. Overall, the results of this portion of the study would parallel what one would expect to see occur on a ropes course in relation to HR responses, an increase in HRs during pre-climb and climb, and then a decrease in HRs during post-climb.

Another significant difference was found when comparing the two groups and the phases. This difference occurred in the form of an interaction of the CD and Non-CD groups between resting phase and pre-climb phase. It is unknown why this might have occurred, but one explanation could be due to cognitive ability. The students with CD could have processed the nature of the challenge slower than students without CD. Students without any mental challenges might have perceived the risk of the challenge as greater prior to beginning the climb. Their mental awareness and anxiety about the

activity could have increased their resting HRs before the climb ever began. Initial resting HRs for students with CD could have been elevated because a majority of them were introduced to HRMs for the first time during the initial data collection. If this in fact were the case, students with CD might actually have had lower resting HRs than reported here, which would have eliminated the interaction found between the groups.

When comparing the heart rate activity of each group at resting, pre-climb, climb, and post-climb phases, no significant difference was found. These results indicate that students with and without CD had similar heart rate responses during all phases of the challenge course activity. Even though a significant difference was found between phases and groups and phases, the information is not meaningful. As stated earlier, the difference in heart rates between the phases was expected due to the nature of the activity; and it is unknown what caused the interaction that occurred between the resting and pre-climb phases since no other interaction or difference was found elsewhere between groups and phases.

The results of previous research would seem to indicate that students with CD might have higher HR responses than students without CD during ropes course participation. However, this is not what this study found. Bunting et al. (1986) found that both pre and post HRs of ropes course participants were higher for low-fit individuals. It has been reported that, as a population, individuals with mental disabilities tend to have lower fitness levels than individuals without mental disabilities (Fernhall et al., 1996; Shepard, 1990; Watkinson & Koh, 1988; Winnick & Short, 1985). This study was not intended to measure fitness levels of the participants, but if in fact these students with CD had lower levels of fitness as research would indicate, one might have expected to find higher HR responses in these individuals.

Based on the results of this study indicating no physiological differences between

the groups, there is no reason physiologically to have different programming protocols for students with and without CD. As the popularity of challenge courses grow in the middle and high school sector, the results in this study show no reason physiologically that students with CD cannot be integrated into a ropes course program with their peers. Facilitators and teachers should not have to adjust intensity levels during the program based on the results found in this study. However, individuals with CD might have other categorical disabilities that do require attention by the facilitator. This study is not to say that all individuals with CD will react the same. Overall health still needs to be addressed with all students whether they are CD or not.

Skills that ropes course leaders use during facilitating a high element activity for students without CD do not need to be changed for students with CD. The results of this study indicate that facilitator actions towards participants' excitement and anxiety still should include guidance, support, and encouragement. Facilitators need to prepare all students for the activity by discussing emotional and physical safety prior to beginning the climb. Elevated HRs for both groups during Phase I indicate that a facilitator needs to consider possible feelings of apprehension by the participants and deal with these feelings in an empathetic manner. Reminding the participants that they are safe and that they are challenging themselves will provide support during Phase II when the individuals are experiencing anxiety and physical stress. As the students complete the ropes course activity, facilitators can provide the same positive reinforcement of the participant's performance for students both with and without CD. Casual conversation, smiles, and "high-fives" for both groups can help individuals to unwind and relax, thus lowering HRs during Phase III.

Knowing that CD students respond physiologically in the same manner as students without CD to the ropes course may open up a fairly new avenue of recreation

and fitness for this population. A typical population of individuals with mental disabilities tends to live sedentary lifestyles (Seaman, Corbin, & Pangrazi, 1999). Providing new opportunities, like ropes course participation, gives this population more choices to lead active, healthy lifestyles. Like individuals without disabilities, persons with cognitive challenges need to develop their own level of fitness. Similar physical fitness gains can occur for individuals with disabilities when given the opportunity to participate in sport and recreational activities (Seaman et al., 1999; Winnick, & Short, 1985). Challenge courses do provide physical challenges that can build fitness components such as strength, flexibility, and cardiovascular endurance (Darst & Armstrong, 1980; Little et al., 1986). With this evidence of the possibility of physical gain, ropes course facilitators and teachers should be openly including and integrating individuals with cognitive disabilities into their programs.

It is required by Federal law to provide accessible and equal recreational facilities for persons with disabilities. Because of these laws, facilitators must become educated on responses of students with disabilities so proper programming can take place. This study showed evidence, for the most part, that facilitator behavior does not need to change when dealing with students with CD.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The primary purpose of this study was to compare HRs of students with and without cognitive disabilities (CD) during an indoor challenge course. The secondary purpose of this study was to compare HR responses of students with and without CD during pre-climb, climb, and post-climb phases of an indoor challenge course. Thirty-eight subjects from Logan and Longfellow Middle Schools in the grades 6th through 8th completed the study. One group consisted of 17 male and female students identified as CD by the La Crosse School District. The second group consisted of 21 male and female students without CD.

Each subject's resting HR was taken at his or her respective school with a Polar Vantage XL HRM prior to arrival at the ropes course. Each subject completed one trial on UW-La Crosse's indoor challenge course. Heart rates were measured by HRMs before, during, and after the climb. HRs were collected on a five-second interval during the three phases.

Data were collected from both groups and statistically analyzed to determine if significant differences occurred in HRs between the groups. Results of the one-way ANOVA with repeated measures indicated that there was no significant ($p > .05$) difference between the HRs of students with and without CD during the resting, pre-climb, climb, and post-climb phases of a challenge course activity. A statistical difference ($p < .05$) did occur between the phases. A significant difference ($p < .05$) also occurred for groups by phases with an interaction between the resting phase and the pre-

climb phase. However, since the HRs of both groups had a comparable change throughout the phases, the overall difference has no practical significance.

Conclusions

Based on the results of this study, the following null hypothesis failed to be rejected:

1. There will be no significant difference in HR responses between students with and without CD on an indoor challenge course.
2. There will be no significant difference in HR responses between students with and without CD during the pre-climb phase.
3. There will be no significant difference in HR responses between students with and without CD during the climb phase.
4. There will be no significant difference in HR responses between students with and without CD during the post-climb phase.

Based on the results of this study, the following null hypothesis was rejected:

5. There will be no significant difference in HR responses between groups by phases.

Recommendations

Based on the results of this study, the following recommendations for future studies are recommended:

1. Perform a Max VO2 test to pre-determine levels of fitness of all subjects.
2. Pre-determine other fitness component levels such as strength and flexibility.
3. Test additional physiological responses such as blood pressure and catecholamine levels to try to account for the anxiety factor of participation.
4. Determine cognitive responses to climbing and perceived risk between the two groups through psychological testing.

5. Increase the number of subjects.
6. Further divide the CD group into individual, categorical disabilities such as "students who only have Autism."
7. Account for the amount of time climbed and height climbed.
8. Combine students with and without CD while being tested.
9. Test individuals on more than one high element.

REFERENCES

Auxter, D., & Pyfer, J. (1989). Principles and methods of adapted physical education and recreation (6th ed.). St. Louis, MO: Times Mirror/Mosby College Publishing.

Bachert, D. W. (1990). Historical evolution of NOLS: The National Outdoor Leadership School. In J. C. Miles & S. Priest (Eds.), Adventure education (pp. 83-88). State College, PA: Venture

Bunting, C. J. (1995). Physiological measurements of stress during outdoor adventure activities. The Journal of Experiential Education, 18(1), 5-11.

Bunting, C. J., Little, M. J., Tolson, H., & Jessup, G. (1986). Physical fitness and eustress in the adventure activities of rock climbing and rappelling. Journal of Sports Medicine, 26, 11-19.

Darst, P. W., & Armstrong, G. P. (1980). Outdoor adventure activities for school and recreation programs. Prospect Heights, IL: Waveland.

Ewert, A. (1986). Outdoor adventure activity programs: A new dimension. Journal of Physical Education, Recreation, and Dance, 57(5), 56-57.

Farbman, A. H., & Ellis, W. K. (1987). Accessibility and outdoor recreation for persons with disabilities. Therapeutic Recreation Journal, 21(1), 70-75.

Fernhall, B., Pitetti, K., Rimmer, J., McCubbin, J., Rintala, A., Millar, L., Kittredge, J., & Burkett (1996). Cardiorespiratory capacity of individuals with mental retardation including Down syndrome. Medicine and Science in Sports and Exercise, 28 (3), 366-371.

Foegen, P.(1998). Cognitive disabilities handbook. Unpublished manuscript, La Crosse School District.

Greene, J., & Thompson, D. (1990). Outward Bound USA. In J. C. Miles & S. Priest (Eds.), Adventure education (pp. 5-9). State College, PA: Venture.

Havens, M. (1992). Bridges to accessibility. Dubuque, IA: Kendall/Hunt.

Latess, D. R. (1986). Physical education and outdoor adventure: Do they belong together? Journal of Health, Physical Education, Recreation, and Dance, 57(5), 64-65.

Little, M. J., Bunting, C. J., & Gibbons, E. S. (1986). Heart rate responses to high ropes course event. The Texas AHPERD Journal, 55(10), 38-42.

Lupton, F. (1990). WEA History. In J. C. Miles and S. Priest (Eds.), Adventure education (pp. 89-95). State College, PA: Venture.

Mensch, J., Onuschak, J. A., VanDriel, J. (1995). Issues: Should elementary and secondary school physical education programs include high risk activities such as rock climbing and ropes course? Journal of Health, Physical Education, Recreation, and Dance, 66(4), 6-11.

Miller, P. (1995). Issues: Should elementary and secondary school physical education programs include high risk activities such as rock climbing and ropes course? Journal of Health, Physical Education, Recreation, and Dance, 66(4), 6-11.

Miner, J. (1990). The creation of Outward Bound. In J. C. Miles & S. Priest (Eds.), Adventure education (pp. 55-66). State College, PA: Venture.

Polar Vantage XL Software, (1993). Polar Heart Rate Analysis Software Manual. Polar Electro OY, Finland.

Priest, S., & Gass, M. A. (1997). Effective leadership in adventure programming. Champaign, IL: Human Kinetics.

Priest, S., & Montelpare, W. (1995). Prediction of HRs on a ropes course from simple physical measure. The Journal of Experiential Education, 18, 25-29.

Prouty, D. (1990). Project Adventure: A brief history. In J. C. Miles & S. Priest (Eds.), Adventure education (pp. 97-109). State College, PA: Venture.

Reader, K. (1996). Ropes Course Universality. Unpublished master's thesis, University of Wisconsin-La Crosse, La Crosse.

Richards, A. (1990). Kurt Hahn. In J. C. Miles & S. Priest (Eds.), Adventure education (pp. 67-74). State College, PA: Venture.

Rohnke, K. (1984). Silver Bullets. Hamilton, MA: Project Adventure, Inc.

Rohnke, K. (1986). Project Adventure: A widely used generic product. Journal of Physical Education, Recreation, and Dance, 57(5), 68-69.

Rohnke, K., Tait, C., & Wall J. (1994). The complete ropes course manual (2nd ed.). Dubuque, IA: Kendall/Hunt.

Rohnke, K., Tait, C., & Wall J. (1994). The complete ropes course manual (2nd ed.). Dubuque, IA: Kendall/Hunt.

Roland, C. (1982). Adventure education with people who are disabled. In G. Robb & P. Hamilton (Eds.), The Bradford Papers, 2. Bloomington, IN: Indiana University.

Roland, C., & Hancock, N. (1984). Ropes courses: Facing the accessibility issue. In G. Robb & P. Hamilton (Eds.), The Bradford Papers, 4. Bloomington, IN: Indiana University.

Seaman, J., Corbin, C., & Pangrazi, B. (1999). Physical activity and fitness for persons with disabilities. Research Digest, 3, 2-8.

Shephard, R. (1990). Fitness in Special Populations. Champaign, IL: Human Kinetics.

Stein, J. (1965). Physical fitness of mentally retarded boys relative to national age norms. Rehabilitation Literature, 26(7), 205-208.

Sugarman, D. (1988). Adventure education for people who have disabilities: A critical review. In G. Robb & P. Hamilton (Eds.), The Bradford Papers, 3. Bloomington, IN: Indiana University.

Sugarman, D. (1993). The impact of the Americans with Disabilities Act on adventure education. The Journal of Experiential Education, 16, 28-30.

Terry, T. (1995). Universal adventure programming: Opening our programs to people with physical disabilities. Journal of Leisurability, 22,(2) 16-19.

Watkinson, E. J., & Koh, S. M. (1988). Heart rate response of moderately mentally handicapped children and youth on the Canada fitness award adapted endurance run. Adapted Physical Activity Quarterly, 5(3), 203-211.

Watts, P. B., Coleman, B., Clure, C., Daggett, M., Gallagher, Sustrich, P., & Wikins, P. (1999). Metabolic and cardiovascular responses during work on a high ropes course. Journal of Sports Medicine and Physical Fitness, 39, 37-41.

Winnick, J., & Short, F. (1985). Physical fitness testing of the disabled. Champaign, IL: Human Kinetics.

APPENDIX A

INFORMED CONSENT

INFORMED CONSENT FORM

A COMPARISON OF HEART RATES OF MIDDLE SCHOOL STUDENTS WITH AND WITHOUT COGNITIVE DISABILITIES DURING A CHALLENGE COURSE EXPERIENCE

1) I, _____, the parent/guardian of _____, give my informed consent for my child to participate in this study on the effect of challenge course activities on heart rates. I have been informed that the purpose of this study is to compare heart rates of students with and without cognitive disabilities while they participate in challenge course activities. Measuring heart rates will allow challenge course facilitators to determine appropriate intensity levels for all participants while involved in a challenge course. This information will help to determine whether programming techniques need to be different for students with and without cognitive disabilities. I have been informed that my child will participate in one 12-minute session at the University of Wisconsin-La Crosse's indoor challenge course while wearing a heart rate monitor consisting of a chest strap and a watch. The heart rate monitors will measure heart rates throughout participation. I also have been informed that my child will participate in a five minute pretest at Longfellow Middle School. The pretest will consist of measuring resting heart rate with the heart rate monitors. I consent to the presentation and publication of study results so long as personal identities remain confidential.

2) I have been informed that my child's participation in this study will include ascending a cargo net and traversing a swinging log. I have been informed that my child will wear a seat harness and a helmet at all times while participating. This harness is connected to a safety rope and is managed by a trained UW-La Crosse staff member. (See attached picture.)

3) I have been informed that my child must complete a UW-La Crosse Adventure Program health and release of liability form prior to participation.

4) I have been informed that the risks of participation include scrapes, abrasions, cuts, pulled muscles, and strains and sprains. Extensive safety precautions will be taken to reduce these risks.

5) I have been informed that the investigator will answer questions regarding the procedures of this study at any time, and that the investigator will supervise all climbing and testing procedures.

6) I have been informed that my child's participation is strictly voluntary, and that I and/or my child may choose to discontinue participation at any time without penalty.

7) I have been informed that a certified athletic trainer will be present while my child participates in this study.

Questions about any aspect of this project may be directed to the principal researcher Jessica Evel (608-782-5342) or the thesis advisor, Dr. Jeff Steffen (608-785-8173). Questions regarding the protection of human subjects may be addressed to Dr. Garth Tymeson, Chair, University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects (608-785-8155).

_____

Researcher (Date)

_____

Parent/Guardian (Date)

_____

Participant (Date)

APPENDIX B

ASSENT FORM

ASSENT FORM

A COMPARISON OF HEART RATES OF MIDDLE SCHOOL STUDENTS WITH AND WITHOUT COGNITIVE DISABILITIES DURING A CHALLENGE COURSE EXPERIENCE

1) The purpose of this project is to compare the heart rates on an indoor ropes course of students receiving special education services with students that do not. I agree that I am willing to try to climb a cargo net and walk across a beam at the University of Wisconsin-La Crosse's indoor ropes course. I agree to wear a monitor that counts my heartbeats. The monitor has a chest strap and a watch. I agree to have my heartbeats counted at Longfellow Middle School before I go to UW-La Crosse.

2) It has been explained to me that I will wear a safety belt and a helmet. A safety rope will be tied to the safety belt while I climb.

3) I know that my parent/guardian must fill out a permission slip from UW-La Crosse.

4) I realize that I may receive some scrapes and cuts or sore muscles from climbing.

5) I have been told that I can ask any questions that I may have.

6) I know that I can choose to not climb at anytime.

7) It has been explained to me that an athletic trainer will be at the ropes course in case of an injury or illness.

_____ _____

Student's name Date

_____ _____

Researcher Date

APPENDIX C

UNIVERSITY OF WISCONSIN-LA CROSSE ADVENTURE PROGRAM

HEALTH AND LIABILITY FORM

UW-LACROSSE

ROPES AND CHALLENGE COURSE
APPLICANT INFORMATION FORM AND RELEASE OF LIABILITY

The University of Wisconsin - La Crosse Ropes and Challenge Course involves a variety of activities that often include warm-ups, games, group initiative problems, trust experiences, low and high elements, and other rigorous physical adventure activities. Participation in a University of Wisconsin - La Crosse program and it's activities is at all times an individual choice. There are risks, which must be assumed by each participant, that he or she may suffer an emotional or physical injury or disability.

The University of Wisconsin - La Crosse Ropes and Challenge Course policy requires that every participant have health/accident insurance coverage. Furthermore, certain health/medical information must be made known to the instructor(s) so that they are prepared to help participants make informed choices about their level of participation during a University of Wisconsin - La Crosse Ropes and Challenge Course program.

The following information will be held in confidence. Please complete the form and return it to the University of Wisconsin -La Crosse Adventure Program Office prior to participating in any activities.

Date(s) of Workshop(s):_____

APPLICANT INFORMATION:

1. Name:_____ Soc. Security No._____

   Sex ____ Date of Birth ____/____/____ Height _____ Weight _____

2. Do you have any health/accident insurance? ___no ___yes If yes, name, and address of company:

_____

MEDICAL INFORMATION:
NOTE: In the interest of trying to provide a successful experience for all participants we ask that you take the time to answer the following questions. This information will be kept in confidence by the University of Wisconsin - La Crosse and only shared with your permission.

3. Does your child have any limiting physical or health disabilities (temporary or permanent)? __no __yes If yes, identify and explain: _____

_____

4. Does your child currently take medication (prescribed or otherwise, e.g. cold medicine)? __no __yes If yes, what is your child taking, and what condition is it for:_____

_____

5. Does your child have any allergies, reactions to medications, or any other medical limitations? __no __yes If yes, identify and explain:_____

_____

6. Does your child have any of the following symptoms/conditions? Circle yes or no and describe below.

   A. Does your child have any history of heart disease, or heart attack? yes/no
   B. Does your child have high blood pressure or any history of high blood pressure? yes/no
   C. Does your child have any chest pains/pressure heart palpations, heart murmurs? yes/no

D. Has your child ever had a stroke? yes/no
E. Does your child have diabetes? yes/no

7. If you circled "yes" to any of the above questions (letters A-E), identify the condition and describe below:

Concern:_____
Detailed Description:_____
_____

Concern:_____
Detailed Description:_____
_____

Concern:_____
Detailed Description:_____
_____

8. Other concerns/issues:

_____
_____

RELEASE OF LIABILITY:
I understand that parts of the University of Wisconsin - La Crosse Ropes and Challenge Course program may be very physically and emotionally demanding. I affirm that my child's health is good, and that my child is under a physician's care for any undisclosed condition that bears upon his or her fitness to participate in any activities presented by the University of Wisconsin - La Crosse Ropes and Challenge Course program. I recognize the inherent risk of injury or disability while my child is participating in the University of Wisconsin -La Crosse's Ropes and Challenge Course activities. I understand that each participant must assume the risk of physical injury that could result from any of these activities. I release the University of Wisconsin - La Crosse, the Ropes and Challenge Course staff members, their agents, owners, officers, volunteers, participants and the Board of Directors, from all liability for any injury or disability that may occur while participating in the University of Wisconsin - La Crosse's Ropes and Challenge Course activities.

Date:_____ Applicants Signature (if at least 18 yrs. Old):_____

Date:_____ Parent or Guardian Signature (if under 18):_____

Please Print Applicants Address:_____

City, State, Zip:_____

Home Telephone #:_____ Business #:_____

Person to contact in case of an emergency:_____
Emergency Phone #:_____

PHOTO/MEDIA RELEASE
Sign if you DO NOT grant to the University of Wisconsin La Crosse the right to use, reproduce, assign and/or distribute photographs, films, videotapes, and sound recordings of your child for use in materials they may create.

Signature (if at least 18 yrs. old):_____

Signature of Parent or Guardian (if under 18):_____

APPENDIX D

CHALLENGE COURSE PICTURE