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Effectiveness of a Surfing Intervention on Children with Disabilities

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EFFECTIVENESS OF A SURFING INTERVENTION ON CHILDREN WITH DISABILITIES

BY

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ABSTRACT

PURPOSE: The purpose of this study was to assess the effectiveness of a surfing intervention on the strength, flexibility, cardiorespiratory endurance, and range of motion of children with disabilities. **METHODS:** Seventeen participants ages 5-17 years, were recruited from the University of Rhode Island Adapted Physical Education Program, Special Olympics Rhode Island and through word-of-mouth. This was an 8-week pilot study with a descriptive study design that used pre and post-testing measurements. Pre-test measurements were taken from the Brockport Physical Fitness Test and included strength (mean±SD; modified curl-ups: 16±17 repetitions; grip strength left: 120.52N± 52.76N; right: 120.03N± 70.61N), flexibility (Back Saver sit-and-reach 11 in.±6.78 in.; trunk lift: 9.19in.± 2.71in.), cardiorespiratory endurance (20-m PACER: 4 laps±4 laps), and range of motion (Modified Apleys Scratch Test left: 12.5º±8.60º; right: 10.82º±7.65º). Pre-test measurements were also taken from the Berg Balance scale measuring balance (49± 7.96). The goal of each hour surf lesson was to teach the participants how to paddle in the water, balance on their board, and ride a wave on the board progressing from laying, to kneeling, to standing.
RESULTS: We found significant improvements in strength (modified sit-ups: 27±24 (P=0.002); grip strength left: 219.67N.± 177.99N. (P=0.024); right 225.55N± 184.07N (P=0.022)), flexibility (Modified Apley's Scratch: 14º±7.38º (P=0.024)) and cardiorespiratory endurance (20-m PACER 6 laps± 6 laps (P=0.013)).
CONCLUSION: These results showed that there is an overall improvement in upper body strength and cardiorespiratory endurance in these participants. Further research

is needed to discern the physiological effectiveness of surfing programs as an alternate exercise modality for children with disabilities.

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TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

According to the World Health Organization (2010), children with disabilities have the same activity requirements as children without disabilities. All children need to accumulate 60 minutes or more of moderate-vigorous intensity activity throughout the day (World Health Organization, 2012). The American College of Sports Medicine (ACSM) recommends 30 minutes of moderate intensity aerobic exercise 3-4 times a week for children with and without disabilities (2010). The benefits of physical activity are universal for all children, including those with disabilities. Developmental disabilities affect about 13% of all children, and an average of 1 in 110 children in the United States have an Autism Spectrum Disorder (CDC, 2011). Children with disabilities who participate in sports and recreational activities have opportunities that promote inclusion, minimize deconditioning, optimize physical functioning, and enhance overall well-being (Murphy, Carbone, and the Council on Children With Disabilities, 2008). Despite these benefits, children with disabilities are more restricted in their participation, have lower levels of fitness, and have higher levels of obesity than their able-bodied peers (Murphy, Carbone, and the Council on Children With Disabilities, 2008).

As a result of engaging in less physical activity, children with disabilities typically demonstrate decreased cardiorespiratory endurance, muscle strength, balance, coordination, and motor skills. This limited participation in physical activity puts them at risk for secondary health problems such as heart disease, high cholesterol, osteoporosis, obesity, and diabetes later in life (Fragala-Pinkham, 2008).

Adapted aquatics programs offer necessary physical activity and educational programming to children with disabilities. The physical and psychosocial benefits of aquatics for students with disabilities are more pronounced and significant than for students without disabilities (Koury, 1996). Due to the buoyancy afforded by water, many whose disabilities impair mobility on land can function independently in an aquatic environment (without the assistance of braces, crutches, walkers, or wheelchairs). Water offers support for the body, enabling a person to possibly walk for the first time, thus increasing strength for ambulation on land. Adapted aquatics also enhance breath control and cardiorespiratory fitness. Research has found improvements in cardiorespiratory endurance, increased exercise capacity, and improved swim skills through the use of swimming lessons, water aerobics, and aquatic resistive exercises (Fragala-Pinkham, 2008). Swimming strengthens muscles that enhance the postural stability necessary for locomotor and object-control skills (Kelly, 2005).

Similar benefits could be derived from ocean surfing. Currently several surf programs are offered to people with disabilities around the world e.g. Surfers Healing, Ride-a-Wave, and the Disabled Surfer's Association in Australia. Surf programs for children are quickly gaining popularity. However, the benefits of these programs have not been formally studied, thus leaving a large gap in the literature.

Theoretically, the ocean setting and surfing activity may offer potential benefits for children with disabilities. Children with autism and other disabilities often become very overwhelmed by sensory stimuli, suffer from severe social isolation, and lack communication (Delaney & Madigan, 2009). The sport of surfing, like running, is solitary, repetitive and requires determination and stamina; most people with autism possess these traits (Delaney & Madigan, 2009). Sports like surfing allow people with disabilities to participate independently without complicated rules and close contact with others, and can potentially help children overcome social barriers (Delaney & Madigan, 2009). Thus, the purpose of this study was to explore the physical benefits; such as balance, strength gains, and fitness; of surfing on children with disabilities. Our hypothesis was that the surfing program will improve the overall physical fitness of children with disabilities by increasing balance, coordination, core and upper body strength, muscular endurance, flexibility, and overall cardiorespiratory endurance.

CHAPTER 2

REVIEW OF LITERATURE

Physical Activity and Children with Disabilities: An Overview

According to the World Health Organization (2010), children with disabilities have the same activity requirements as children without disabilities. All children need to accumulate 60 minutes or more of moderate-vigorous intensity activity throughout the day (World Health Organization, 2012). The American College of Sports Medicine (ACSM) recommends 30 minutes of moderate intensity aerobic exercise 3-4 times a week for children with and without disabilities (2010). The benefits of physical activity are universal for all children, including those with disabilities. Developmental disabilities affect about 13% of all children, and an average of 1 in 110 children in America have an Autism Spectrum Disorder (ASD) (CDC, 2011). Children with disabilities who participate in sports and recreational activities benefit from inclusion, minimized deconditioning, optimized physical functioning, and enhanced overall well-being (Murphy, 2008). Despite these benefits, children with disabilities are more restricted in their participation in fitness-related activities, have lower levels of fitness, and have higher levels of obesity than their peers without disabilities (Murphy, 2008).

This limited participation in physical activity puts them at risk for secondary health problems such as heart disease, high cholesterol, osteoporosis, obesity, and diabetes later on in life (Fragala-Pinkham, 2008). It is then no surprise that these individuals have 1.7-4 times higher mortality rates when compared to their peers without disabilities (Hayden, 1998). One of the most common medical problems in this population is cardiovascular and pulmonary disorders that are exacerbated by their lower levels of physical activity (Hayden, 1998; Fernhall, 1987). As a result of engaging in less physical activity, children with disabilities typically have decreased cardiorespiratory endurance, muscle strength, balance, coordination, and motor skills. Research also indicates that aerobic exercise programs improve cardiorespiratory endurance and other physiological responses of children with disabilities (Kelly, 2005). One such way to measure cardiorespiratory endurance, muscle strength, and flexibility in children with disabilities is the Brockport Physical Fitness Test. The Brockport Physical Fitness Test is a test based off of the Prudential FITNESSGRAM, which has been adopted by the Presidential Youth Fitness Program in 2012 to promote physical activity (FITNESSGRAM, 2013). Though there is a section for children with disabilities in the Prudential FITNESSGRAM, it was not standardized to specific disabilities (Short, 1999). The Brockport Physical Fitness Test is standardized to various disabilities that can be administered to both males and females. The criteria for the tests are based on literature found indicating the validity and reliability of the tests to evaluate the physical fitness of the children (Short, 1999).

Balance is an integral part in gross motor control and postural control and is an important focus in physical function (Kembhavi, 2002). In order to evaluate balance the Berg Balance scale was used. The Berg Balance Scale was traditionally developed to measure balance in older adults with balance impairments, and is considered by some to be the gold standard in evaluating balance in older adults (Berg, 1989; Liston, 1996). The test consists of 14 items scored on a scale from 0-4, based on whether the participant is able or unable to perform the task. Reliability of the test is found in various research, however this reliability is primarily in older adults. Cattaneo et al. (2006, 2007) investigated the validity and reliability of the Berg Balance Scale in adults with multiple sclerosis and found concurrent validity and reliability in the participants. If the Berg Balance Scale can be used in adults with a balance disorder, then it may be useful for children with various disabilities. There is research evaluating the use of the Berg Balance Scale for children with disabilities, Kembhavi et al. (1996) found the Berg Balance Scale has the potential to be used with children diagnosed with cerebral palsy with moderate balance impairments. There are modified versions that have been renamed pediatric balance scales, however, the differences are minor and the validity and reliability of the Berg Balance Scale examining balance capacity and functionality outweigh those differences (Kembhavi, 1996).

Unfortunately, opportunities for children with disabilities to participate in fitness and activity programs, whether for leisure, recreation, or competition, are limited (Murphy, Carbone, and the Council on Children With Disabilities, 2008; Okagaki, Diamond, Kontos, & Hestenes, 1998). Children with learning disabilities are often alienated or excluded by typically developing children for both physical and social reasons (Diamond & Tu, 2008; Okagaki, Diamond, Kontos, & Hestenes, 1998; Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004; Wurmser, 2010).The challenge seems to arise when attempting to implement physical activity and make it accessible for children with disabilities.

Aquatic Programs for children with disabilities: An Overview

Adapted aquatics programs offer necessary physical activity and programming to children with disabilities. The physical and psychosocial benefits of aquatics for students with disabilities are more pronounced and significant than for students without disabilities (Koury, 1996). Swimming requires bilateral movements of all extremities, and enhances vestibular input that could increase muscular strength, joint range of motion, and gross motor coordination (Peganoff, 1984). Due to the buoyancy afforded by water, many people with disabilities experience impaired mobility on land and function independently in an aquatic environment without the assistance of braces, crutches, walkers, or wheelchairs. Water offers support for the body, enabling a person to possibly walk for the first time, thus increasing strength for ambulation on land. Adapted aquatics may also enhance breath control and cardiorespiratory fitness. Research has found improvements in cardiorespiratory endurance, increased exercise capacity, and improved swim skills through the use of swimming lessons, water aerobics, and aquatic resistive exercises (Fragala-Pinkham, 2008). Swimming strengthens muscles that enhance the postural stability necessary for locomotor and object-control skills (Kelly, 2005).

Research has shown that aquatic exercise programs not only help promote physical activity, but also increase overall physical fitness in this population. Fragala-Pinkham, Haley, and O'Neil (Fragala-Pinkham, 2008) evaluated group aquatic exercise for children with disabilities with cardiorespiratory endurance and muscle strength measures. Cardiorespiratory endurance was measured using the half-mile walk/run, for lower extremity isometric muscle strength variables were used and abdominal strength and endurance were measured with a modified curl-up as specified by the Brockport Physical Fitness Test Manual (Short, 1999). Results indicate an increase in cardiorespiratory endurance ($p<0.001$), however there were no significant improvements in lower extremity strength or abdominal strength and endurance.

Kelly and Darrah (Kelly, 2005) reviewed the literature on aquatic exercise as a modality for children with cerebral palsy. Through their review they found several studies to indicate that aquatic exercise programs improved muscle strength, cardiorespiratory function, and gross motor skills in children with cerebral palsy. Peganoff (Peganoff, 1984) found length swimming to improve his participants' self-image, shoulder flexion and abduction. Hutzler et al. (1998) used land-based and aquatic movement exercises for 46 participants and found significant improvements in their vital capacities. Finally, Thorpe and Reilly (2000) used water walking and lower extremity resistance exercise to improve gait velocity, self perception, and muscle strength in their participants.

Fragala-Pinkham, O'Neil, and Haley (2010) also evaluated the effectiveness of an aquatic exercise program on fitness and swimming skills in children with disabilities (ages of 6-12 years old). Of the 16 children who participated they found that the majority improved their swimming skills and their physical activity levels. In addition, parental satisfaction improved. The majority showed improvements in endurance (n=13), strength (n=13), confidence and/or self-esteem (n=14), participation in group activities (n=11), gross motor skills (n=10), balance (n=9), and their overall swim skills (n=12). This program demonstrated that there were benefits to aquatic exercise for children with disabilities and the authors encouraged further research and the development of new programs for this population.

Researches done on aquatic exercise programs typically lasts 45 minutes and were run at least twice a week for 10 to14 weeks (Groter, 2011). This meets the guidelines of the American College of Sports Medicine of meeting two to three times a week on non consecutive days (2010). Benefits are not limited to the physical realm. Water activities that are carefully planned and implemented to meet individual needs provide an environment that contributes to psychosocial and cognitive development (Yilmaz, I., Yanardag, M., Birkan, B., Bumin, G., 2004). Supportive evidence shows that aquatic exercise in a group environment provides a socially motivating and stimulating environment for children with disabilities (Kelly, 2005). As a student with a physical disability learns to move through the water without assistance, self-esteem and self-awareness improve. The freedom of movement made possible by water boosts morale and provides an incentive to maximize potential in other aspects of rehabilitation (Koury, 1996). Moreover, the motivational and therapeutic properties of water provide a stimulating learning environment.

Surfing: An Overview

Similar benefits could potentially be derived from using the ocean as a modality for aquatic programs. Currently several surf programs are offered to people with disabilities around the world e.g. Surfers Healing, Ride-a-Wave, and the Disabled Surfer's Association in Australia. Surf programs for children are quickly gaining popularity. Though aquatic programs have been studied and shown to be beneficial to children with disabilities, the benefits of these programs have not been formally studied, thus leaving a large gap in the literature.

To begin looking at surfing as a mode of gaining aerobic fitness for children with disabilities Mendez-Villanueva and Bishop (2005) looked at the physiological aspects of surfing and riding a surfboard. Through a time-motion analysis, they were able to give an analysis of what takes place in an hour of recreational surfing practice and found that 55%-60% of the time the surfers are paddling or doing various surfing activities, and between 35%-40% of the time they remain stationary recovering. Their data illustrates the high aerobic capacity of a surfer, that they remain at an intensity of 75%-85% of their heart rate, and that surfers have a high lactate threshold and high VO_2max. This review demonstrates the physiological responses the body has "on-water", where heart rate (HR) is measured and used to determine the intensity of the sport for merely an hour. In that hour six recreational surfers maintained a HRpeak between 75% and 95%. Overall, the review indicated that surfing is highly aerobic. This article gives a broad range of topics relating to the physiology of surfing from the physical characteristics of a surfer to the training guidelines and shows that surfing can be used as an excellent mode for obtaining aerobic exercise.

Research on surfing as a mode of therapy has been done with veterans with disabilities. Fleischmann et al. (2010) found both psychological and physiological benefits from a 6 month surfing intervention in a 21 year old soldier that suffered from a blast injury resulting in bilateral transfemoral amputation, severe burn injuries, and traumatic brain injury. By the end of the surfing program his balance had significantly increased; this individual had gained the vestibular functions to walk on two prosthetics as his means of mobility. Though this study does not involve children with disabilities, it demonstrates that there is a great potential for surfing to be used as a treatment modality.

Theoretically, the ocean setting and surfing may offer potential benefits as an activity for children with disabilities. The sport of surfing, like running, is solitary, repetitive and requires determination and stamina; most people with autism possess these traits (Delaney, 1999). Sports like surfing allow people with disabilities to participate independently without complicated rules and close contact with others, Thus, the purpose of this study is to bridge the gap in the literature and explore physical benefits; such as balance, strength gains, and fitness; on surfing in children with disabilities. Our ultimate goal is create new, reliable and valid modalities of therapy as programs for children with disabilities.

CHAPTER 3

METHODOLOGY

Subject: Participants were recruited from the University of Rhode Island Physical Education Health Education Teacher Education (PHETE) Adapted Physical Education class and through word-of-mouth in the local community. Individuals interested in participating in the study needed to meet the inclusion criteria (see Table 1). This included being between the ages of 6 and 18 years old, diagnosed with developmental, sensory, and/or physical disabilities, considered functional by report of a parent/guardian, cleared by a medical doctor, and have a consent form signed by their parent/guardian and an assent form signed by the participants. Participants were then paired with volunteers for one-on-one instructions. The volunteers were recruited from the University of Rhode Island PHETE program, Kinesiology department, and local community. The volunteers went through a training session before the intervention began to ensure each participant received the same instruction on goals and surfing safety orientation before the start of the program.

Study Design: This was a pilot study with a descriptive study design that had no control group. There were pre and post-testing measurements. Once the participants were recruited and had both consent and assent forms signed, pretesting began. The University of Rhode Island PHETE Adapted Physical Education classes performed these fitness tests at the start of the program, therefore, each year participants are familiar with the tests they were asked to perform. In the event that a participant was not familiar with the tests, there was also a practice day to familiarize all the participants with the tests that they were asked to perform. All outcome measures tested at baseline were repeated during post-testing at the end of the surf program. Pre-, during and post- measures took place as follows:

1. Pre-measures: All participants were assessed with the Berg Balance Scale and the Brockport Fitness Test. In addition, grip strength, joint range of motion was also measured and recorded. Baseline physical activity data including heart rate (heart rate monitors) were collected one week prior to commencement of the surf program.
2. During: All participants wore heart rate monitors for the duration of each surfing session.
3. Post-measures: The same measures from the pre-measures section were used.

Measurements: The fitness test used in this study was the Brockport Physical Fitness Test (BPFT) which is based on the Prudential FITNESSGRAM procedures (Cureton, 1994). Differences between the two include that the FITNESSGRAM procedures are not modified or standardized for specific disabilities, where as the BPFT is (Cureton, 1994). These tests measured the participants' cardiorespiratory endurance, flexibility, muscular strength and endurance (Short, 1999). The 20-m Pacer test was used to measure cardiorespiratory endurance. This test estimated their aerobic capacity and was used to estimate the VO_2 max of the individual. To measure upper-body flexibility, the Modified Apleys test was used to examine both right and left arms, measured flexibility and range of motion of the individuals' shoulders were made. These measures were made using a goniometer and the units were in degrees. For lower-body flexibility the Back Saver Sit and Reach test was used. This also measured the range of motion in their lower extremity. Both left and right sides were tested three times and the averages of those scores were recorded. To measure upper-body strength the Hand Grip Dynamometer was used for both the right and left hands. Each hand was tested three times and the average of the three was recorded. Another measure of upper-body strength used was an Isometric Push-Up. This tested upper-body strength and endurance. Trunk Lift was used to demonstrate overall abdominal function and the Modified Curl-Up was used to show abdominal strength (see Appendix).

To measure balance, the Berg Balance Scale was used. The test consists of 14 items scored on a scale from 0-4. Once all tests are completed the scores are added together to give a total score out of 56.

The participants also wore Polar heart rate monitors during the surf sessions in order to measure the intensity of the program. The watches and bands were assigned to each participant at the beginning of the study. A week prior to the start of the study the participants wore the watches for one week while they were awake to gather baseline data for each. Once the study began the participants only wore the watches and heart rate monitors during the surfing sessions. During each session, the watches were placed on the participants and the watches started before each entered the water. They were stopped when the participants returned from the session. After each session the watches were collected and the data submitted onto the Polar case E-Series software. At the end of the program the participants received the watches two weeks after the post-testing when they were instructed to wear the watches for at least three days to collect post- testing data. Once all the watches were returned all of the data was complied onto the Polar E-Series software.

Surf Program: The surf program was one hour sessions that met twice a week for eight weeks. At the beginning of the program each participant was paired up with a surf instructor. The surf instructors were volunteers recruited from the University of Rhode Island and the local community. The participant and instructor were given surf boards and wet suits to use for the duration of the study. In addition they were given a course on safety and surf instructions while in the ocean. The parents and/or guardians of the participants were required to be on the beach while their child was in the water. The surf program was designed with these instructional goals in mind: 1) how to paddle, 2) how to balance on a surfboard while either sitting, laying, kneeling or standing, 3) how to catch a wave and ride it into shore either on the stomach, sitting, or standing (progressing in that manner), and 4) how to paddle back out through the wave unassisted. These goals were designed as guidelines for the surf instructors and the participants to progress through. Emphasis was placed on the child's needs and abilities. Instructors were encouraged to design instruction around each child's needs. Individual goals were created specifically for each child.

Statistical Analysis: We used SPSS statistical software to analyze our data. Given the broad variability in disabilities, we used a Shapiro-Wilk Test to examine the normality of our measures. For the normally distributed data we ran a repeated measures multivariate analysis of variance test using two time points (pre and post) and the measurements of the applicable tests. Significance was based on an alpha of 0.05 using a Bonferroni correction and a 95% confidence interval. The data was represented as mean ± the standard deviation.

For the non-normally distributed data we used the nonparametric test of Wilcoxon Signed Ranks Test for paired variables. This test allows us to examine the differences in paired variables (such as changes over time) when measures aren't normally distributed.

This study was approved by the Institutional Review Board at the University of Rhode Island as of March, 2012 (IRB Approval # 283941-4) and informed consent was obtained.

CHAPTER 4

RESULTS

A total of 16 children participated in the surf program. All participants were made familiar with each of the testing protocols before performing them. We used exploratory, descriptive methods to examine the normality of our measures given the broad variability in disabilities. Using Shapiro-Wilk Test for normality we found that the trunk lift, modified curl-up, isometric push-up, 20m Pacer, and the Berg Balance Scale scores was not normally distributed ($P<0.05$). For the normally distributed data we ran a repeated measures multivariate analysis of variance using two time points (pre and post) and measurements of the sit and reach, modified Apley's Scratch test, and hand grip for each hand. We found there was no multivariate time main effect ($F(1,12)= 1.1$, $P = 0.639$), however, given that this was a pilot study we used the univariate effect with a Bonferroni correction. Significance was based on an alpha of 0.05 using a Bonferroni correction and a 95% confidence interval.

For the non-normally distributed tests (the trunk lift, modified curl-up, isometric push-up, 20m Pacer, and the Berg Balance Scale) we used the nonparametric test of Wilcoxon Signed Ranks test for paired variables. This test allows us to examine the differences in paired variables (such as changes over time) when measures aren't normally distributed. Both normally and non-normally distributed data are represented in Table 1.

For those tests that were normally distributed, we found significant increases in the grip strength in both hands and the right hand of the Apley's Scratch Test. The results for the grip strength of both the left and right hand were 219.67N± 177.99N, a significance of P=0.024, and 225.55N ± 184.07N, a significance of P=0.022, respectively. The results for the right hand of the Modified Apley's Scratch Test were 14°± 7.38°, a significance of P=0.034. The left hand of the Modified Apley's Scratch Test results were 14°±7.08°, where P= 0.095, indicating no significant improvements. The Back Saver Sit-and-Reach test for both left and right arms remained unchanged (left: 29.06in.± 9.10in., P = 0.779 and right: 29.03in.±9.24in., P = 0.986).

For the tests that showed non-normally distributed data, we found significant improvements when looking at the modified curl-up, and the 20m Pacer. The results for the modified curl-up were 27±24 repetitions, a significance of P=0.002. The results indicate that the 20m Pacer, which tested the cardiovascular fitness of the participants, significantly improved with the results being 6 ± 6 laps (P=0.013). There were no significant improvements with the trunk lift. The results were 9.8in.±1.85in. (P =N.S.). There were also no significant improvements in isometric push-up where the results were 2:00.4 min± 0:37.79 min post-test (P=N.S.).

The Berg Balance Scale was also a non-normally distributed test, and the results were not significantly changed with the program (P =N.S.). The participants increased from pre-testing scores of 49±7.96 to 52±5.02 out of a total of 56 points. Figure 1 illustrates the pre and post-testing scores of the Beg Balance Scale.

The heart rate monitor data is illustrated in Figure 2. The data indicates that during the surfing program the majority of the time the participants maintained a heart rate below 75% of their heart rate max (74.10%). With that in mind, it did indicate that they were either in or above 75% of their estimated maximal heart rate roughly 26% of the time.

Table 1: Pre and Post-Testing Results

	Test	*Pre ±SD*	*Post ±SD*	*Improvements*	*Significance*
Strength	Grip strength (L)	120.52N± 52.76N	219.67N± 177.99N	99.15N	P = 0.024[a]*
	Grip strength (R)	120.03N± 70.61N	225.55N ±184.07N	105.52N	P = 0.022[a]*
Endurance	Isometric Push-Up	1:28.8 min± 0:53.56 min	2:00.4 min± 0:37.79 min	0:31.6min	P = N.S.[b]
Core	Modified curl-ups	16±17 repetitions	27±24 repetitions	11 repetitions	P = 0.002[b]*
	Trunk lift	9.19in.± 2.58in.	9.8in. ± 1.85in.	0.61in	P = N.S.[b]
Flexibility	Back Saver Sit-and-reach (L)	28.63in.± 10.06in.	29.06in.± 9.10in.	0.43in	P = N.S.[a]
	Back Saver Sit-and-reach (R)	29in.± 9.69in.	29.03in.± 9.24in.	0.03in	P = N.S.[a]
	Modified Apley's scratch (L)	12.5°±8.60°	14°± 7.08°	1.5°	P = 0 .095[a]
	Modified Apley's scratch (R)	10.82°±7.65°	14°± 7.38°	3.18°	P = 0 .034[a]
CR Endurance	20-m PACER	4 laps±4 laps	6 laps± 6 laps	2 laps	P = 0.013[b]*
Balance	Berg Balance Scale	49±7.96 points	52±5.02 points	3 points	P=N.S.[b]

* = Statistically significant

N.S.= Not significant

[a]= Adjustment for multiple comparisons: Bonferroni

[b]= Wilcoxon Signed Ranks Test

Figure 1: Pre and Post-Testing Scores off the Berg Balance Scale

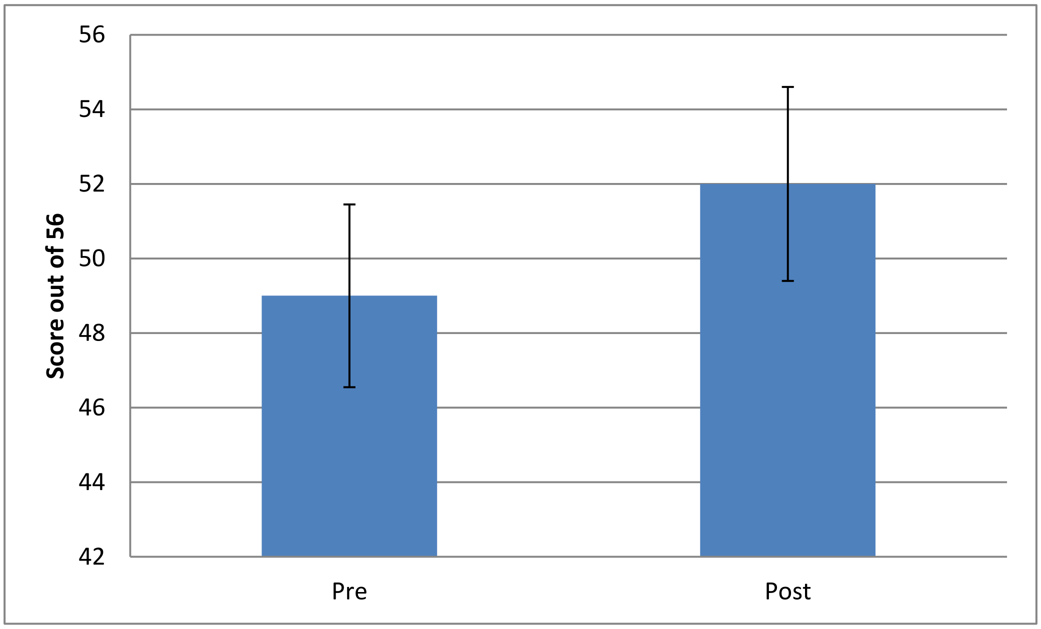
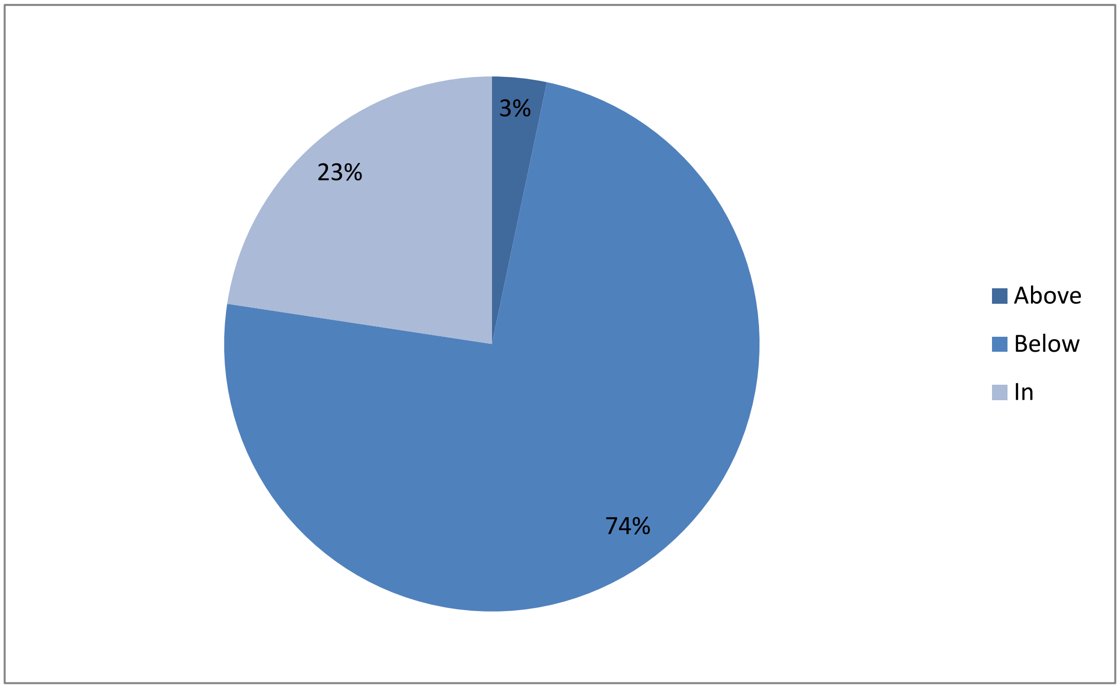


Figure 2: Amount of Time Participants Spent in 75% of their Estimated Heart Rate Max During Surf Sessions



CHAPTER 5

DISCUSSION

Our results indicated that this surfing program improved numerous areas of physical fitness. There were significant improvements in the participants' upper-body, core, and cardiorespiratory endurance. For the upper-body, both left and right hand grip strength scores had statistical significance of $P = 0.024$ and $P = 0.022$, respectively. The results for the left hand increased from 120.52N± 52.76N to219.67N± 177.99N and right hand 120.03N± 70.61N to 225.55N ±184.07N. These improvements could be attributed to the nature of the sport, for instance: being able to carry the surf board to and from the ocean, using arms while swimming, and repetitive arm motions needed to paddle though the water. Improvements in muscular strength have been seen throughout previous research in adapted aquatic exercise; however the majority of these significant improvements in muscular strength were in participants' lower extremities.

There was a substantial improvement in the participants' core strength, 27±24, significance of $P = 0.002$ for the modified curl-up. Research by Fragala-Pinkham et al. (2010) also found improvements from aerobic aquatic exercise in the modified curl-up. Another core strength component was the isometric push-up, which more specifically looks at core endurance and showed improvement as well ($P= 0.099$). Both of these improvements in core strength and endurance are potentially quite beneficial, especially for children with disabilities who typically have limited postural control (Liao, 1997). With the trunk lift there was no significant improvements from pre to post-testing. This could be an example of a ceiling effect, where the participants exceed the maximal score and because the score is capped the results did not identify possible improvements.

The flexibility components of the tests found that the back saver sit-and-reach test for both left and right sides had no significant increases. The Modified Apley's scratch test remained unchanged in the left arms (P= 0 .095) however, there were significant improvements in the participants right arms (P= 0 .034). These improvements could be due to the water resistance while paddling through the waves, increasing strength and range of motion. These results are consistent with research by Peganoff et al. (1984) who found lap swimming improved shoulder flexion and abduction.

One of the most significant improvements of this study was the participants' improvement in cardiorespiratory endurance. These improvements are potentially due to the natural resistance of the ocean and walking through water as well as swimming through the waves. A review by Mendez-Villanueva et al. (2005) indicated that surfing was a highly aerobic activity. These results are also consistent with previous research on aquatic exercise programs. Fragala-Pinkham (2008) found improvements after a 14-week aquatic aerobic exercise intervention in cardiorespiratory endurance results. Another study by Fragala-Pinkham (2010) found that the use of an aerobic aquatic exercise improved not only aerobically, but also found improvements in muscle strength, modified curl-up and energy expenditure. Retarekar et al. (2009) also found improvements in their participants' energy expenditure with the use of anaerobic aquatic training. Though there was an increase in the number of laps in the 20-m PACER test, it should be noted for reference that according to the Brockport Physical Fitness Test (Short, 1999) the minimal standard for the number of laps for males 10 years of age with disabilities is four laps, which comes to a VO_2 max of 38ml/kg/min. Despite the data finding significant increases, further research is indicated in children with disabilities to uncover how cardiovascular fitness impacts secondary health problems later in life.

The Polar heart rate monitors (HRM) illustrated the intensity of the surf program on each of the participants. The HRM’s were programmed to each participant to target their heart rate at 75% of their maximum. Contrary to the increases in aerobic functioning seen in the pre and post testing measures of the 20-m PACER, we found that the majority of the time, the participants seemed to be below their target heart rate. The data shows that for an hour of surfing, participants spent 74.10%, roughly 44 minutes of the time below 75% of their maximal heart rate, 3.3%, roughly 2 minutes of the time above 75% of their maximal heart rate, and 22.6%, roughly 14 minutes of the time they were in 75% of their maximal heart rate. In other words, they spent 16 minutes, a quarter of the surf session, at or above the target heart rate of 75%. With that in mind it is safe to assume that there should be improvements if their target heart rate was 60% of their maximal heart rate. In addition, the aerobic benefits were only one of the components we were looking at in the surf program, and these results indicated both aerobic, anaerobic, and strength improvements. One concern with the use of the heart rate monitors is that we do not know if they were connected or reading the heart rates the entire time the participants were in the water. On more than one occasion the participants would leave their heart rate monitors on long after they had finished surfing.

One of the primary limitations to this study was that there was no control group. However, this was a pilot study and our intention was to prove feasibility and efficacy of our procedures. With the positive results we did see, further research is indicated. Some other limitations noted in this study included the number of participants recruited, the weather, and the participants' ability to attend the program twice a week for 8 weeks. Since the participants are children, maturation will occur regardless of the effects of the surf program, which can be taken into consideration only with a control group. Finally, there was a wide range of children with disabilities in this study which included intellectual disabilities, learning disabilities, Down syndrome, several Autism Spectrum disorders, Microcephaly, Global Developmental Delays, Dandy-Walker syndrome, heart defects including hypoplastic left heart syndrome, and hypothyroidism. That being said, further research is pertinent to look more specifically at each disability and determine the physiological effectiveness of a surfing intervention on children with disabilities. In conclusion, our results indicate a surfing program is feasible and useful to improve cardiorespiratory endurance and other physiological responses of children with disabilities.

APPENDICES

STATEMENT OF THE PROBLEM

Due to the therapeutic nature of the ocean, a research project to explore the potential mental/emotional and physical benefits of surfing on children with disabilities would be extremely helpful in creating new therapy programs for this population.

Primary Aim: To investigate the physiological effect of an 8 week surfing intervention program on children with disabilities.

Hypothesis: The surfing program will improve the overall physical fitness of children with disabilities by increasing balance, coordination, core and upper body strength, muscular endurance, flexibility, and overall cardiorespiratory endurance.

VALIDITY AND RELIABILITY OF THE FITNESS TESTS BASED ON

BROCKPORT PHYSICAL FITNESS TEST (Short, 1999)

Fitness Tests	**Fitness Component**	**Validity**	**Reliability**
Back Saver Sit and Reach	Flexibility/ROM	Logical (Plowman & Corbin, 1994)	α = .95-.97 (GP) (Patterson, Wiksten, Ray, Flanders, & Sanphy, 1996) α = .95-.96 (MR)(Short & Winnick, 1999)
Trunk Lift	Trunk/abdominal function	Logical (Plowman & Corbin, 1994)	P=.89 (Short & Winnick, 1999)
Modified Apley test	Flexibility/ROM	Logical	No data available
Modified Curl-Up	Trunk/abdominal function	Logical (Plowman & Corbin, 1994)	α = .82 (MR)(Short & Winnick, 1999)
Hand Grip Dynamometer	Upper-body strength/endurance	Construct (Winnick & Short, 1982); logical	Most coefficients in the .90s (Safrit & Wood, 1995)
Isometric Push-Up	Upper-body strength/endurance	Logical	R= .83 (Eichstaedt & Lavay, 1992) α = .83 (MR)(Short & Winnick, 1999)
20 m Pacer	Aerobic Capacity	High Content; moderate concurrent (Cureton, 1994)	r =.89 (GP) (Leger, Mercier, Gadoury, & Lambert) α = .97 (MR) (Short & Winnick, 1999)

ROM= range of motion
GP= general population
MR= mental retardation

r = interclass reliability coefficient
R = intraclass reliability coefficient
α = Cronbach's alpha coefficient

BERG BALANCE SCALE

SITTING TO STANDING
INSTRUCTIONS: Please stand up. Try not to use your hand for support.
( ) 4 able to stand without using hands and stabilize independently
( ) 3 able to stand independently using hands
( ) 2 able to stand using hands after several tries
( ) 1 needs minimal aid to stand or stabilize
( ) 0 needs moderate or maximal assist to stand

STANDING UNSUPPORTED
INSTRUCTIONS: Please stand for two minutes without holding on.
( ) 4 able to stand safely for 2 minutes
( ) 3 able to stand 2 minutes with supervision
( ) 2 able to stand 30 seconds unsupported
( ) 1 needs several tries to stand 30 seconds unsupported
( ) 0 unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL
INSTRUCTIONS: Please sit with arms folded for 2 minutes.
( ) 4 able to sit safely and securely for 2 minutes
( ) 3 able to sit 2 minutes under supervision
( ) 2 able to able to sit 30 seconds
( ) 1 able to sit 10 seconds
( ) 0 unable to sit without support 10 seconds

STANDING TO SITTING
INSTRUCTIONS: Please sit down.
( ) 4 sits safely with minimal use of hands
( ) 3 controls descent by using hands
( ) 2 uses back of legs against chair to control descent
( ) 1 sits independently but has uncontrolled descent
( ) 0 needs assist to sit

TRANSFERS
INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
( ) 4 able to transfer safely with minor use of hands
( ) 3 able to transfer safely definite need of hands
( ) 2 able to transfer with verbal cuing and/or supervision
( ) 1 needs one person to assist

(   ) 0 needs two people to assist or supervise to be safe

STANDING UNSUPPORTED WITH EYES CLOSED
INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.
(   ) 4 able to stand 10 seconds safely
(   ) 3 able to stand 10 seconds with supervision
(   ) 2 able to stand 3 seconds
(   ) 1 unable to keep eyes closed 3 seconds but stays safely
(   ) 0 needs help to keep from falling

STANDING UNSUPPORTED WITH FEET TOGETHER
INSTRUCTIONS: Place your feet together and stand without holding on.
(   ) 4 able to place feet together independently and stand 1 minute safely
(   ) 3 able to place feet together independently and stand 1 minute with supervision
(   ) 2 able to place feet together independently but unable to hold for 30 seconds
(   ) 1 needs help to attain position but able to stand 15 seconds feet together
(   ) 0 needs help to attain position and unable to hold for 15 seconds

REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING
INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)
(   ) 4 can reach forward confidently 25 cm (10 inches)
(   ) 3 can reach forward 12 cm (5 inches)
(   ) 2 can reach forward 5 cm (2 inches)
(   ) 1 reaches forward but needs supervision
(   ) 0 loses balance while trying/requires external support

PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION
INSTRUCTIONS: Pick up the shoe/slipper, which is place in front of your feet.
(   ) 4 able to pick up slipper safely and easily
(   ) 3 able to pick up slipper but needs supervision
(   ) 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance
independently
(   ) 1 unable to pick up and needs supervision while trying
(   ) 0 unable to try/needs assist to keep from losing balance or falling
TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING
INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.

( ) 4 looks behind from both sides and weight shifts well
( ) 3 looks behind one side only other side shows less weight shift
( ) 2 turns sideways only but maintains balance
( ) 1 needs supervision when turning
( ) 0 needs assist to keep from losing balance or falling

TURN 360 DEGREES
INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
( ) 4 able to turn 360 degrees safely in 4 seconds or less
( ) 3 able to turn 360 degrees safely one side only 4 seconds or less
( ) 2 able to turn 360 degrees safely but slowly
( ) 1 needs close supervision or verbal cuing
( ) 0 needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touch the step/stool four times.
( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds
( ) 3 able to stand independently and complete 8 steps in > 20 seconds
( ) 2 able to complete 4 steps without aid with supervision
( ) 1 able to complete > 2 steps needs minimal assist
( ) 0 needs assistance to keep from falling/unable to try

STANDING UNSUPPORTED ONE FOOT IN FRONT
INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)
( ) 4 able to place foot tandem independently and hold 30 seconds
( ) 3 able to place foot ahead independently and hold 30 seconds
( ) 2 able to take small step independently and hold 30 seconds
( ) 1 needs help to step but can hold 15 seconds
( ) 0 loses balance while stepping or standing

STANDING ON ONE LEG
INSTRUCTIONS: Stand on one leg as long as you can without holding on.
( ) 4 able to lift leg independently and hold > 10 seconds
( ) 3 able to lift leg independently and hold 5-10 seconds
( ) 2 able to lift leg independently and hold ≥ 3 seconds
( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
( ) 0 unable to try of needs assist to prevent fall

( ) TOTAL SCORE (Maximum = 56)

CONSENT FORMS

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Parent/Guardian Permission Form

Spring 2012

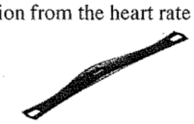
Dear Parent or Guardian,

Your child is invited to participate in a research study. I am a faculty member in the Kinesiology Department at the University of Rhode Island. I teach in the Physical Education, Health Education Teacher Education Program (PHETE) and also serve as the Adapted Physical Education Director. I am conducting a research study on the effects of a surfing program on children with special needs. The research study is called "Catching Waves of Health: Exploring the Benefits of Surfing on Children with Special Needs." The purpose of this study is to learn about the potential physical, mental/emotional and social benefits of surfing. The program will take place at URI in the Kinesiology Building and also at Narragansett Town Beach. This research is a following up to the "Learn to Surf Day" we had last summer with the students in KIN 585- Disability Sports. The same participants and researcher (Emily Clapham) will be invited to participate in the research.

I am also collaborating with Dr. Jennifer Audette, an Assistant Professor in Physical Therapy, Dr. Linda Lamont a professor in Exercise Science, a graduate student in the Kinesiology department, Cortney Armitano, a group of five physical therapy students and several undergraduate students in the PHETE program and the KIN department.

Throughout the program, your child will be asked to wear a heart rate monitor, a pedometer, partake in fitness and balance testing, take a self-esteem survey and measurements of grip strength, percent body fat and range of motion will also be taken. You will be asked to complete a survey on your perceptions of the surf program.

A heart rate monitor is a device that measures heart rate, stress and recovery from exercise. It is worn under the chest and above the stomach on the sternum. Heart rate, recovery from exercise and stress data will be collected after each surf session from the heart rate monitors.



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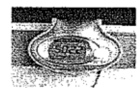
Pedometers are devices that measure how many steps a person has taken, physical activity and calories expended. They are clipped to the waistband like a pedometer. The pedometers will be worn the entire day throughout the duration of the study. Activity counts will be collected from the pedometers each day.



This research aims to learn how surfing affects your child's heart rate, stress levels and recovery from exercise. Your child will be asked to wear a heart rate monitor each time he/she goes surfing.

In addition, we will be administering a fitness test called the Brockport Fitness Test. It is a fitness test that is administered in schools to determine whether children need to receive adapted physical education (APE). The test measures cardiorespiratory endurance, muscular strength and endurance and flexibility. We will also be administering a balance test called the Berg Balance Scale and measurements of grip strength, percent body fat and range or motion will also be taken. You are more than welcome to observe your child's participation in this test and assist them if necessary. The tests will be administered at the beginning of the eight-week surfing program and again at the end of the program to see if the surf program made an impact on physical fitness and will take between 45 minutes to an hour to complete.

We will also be administering a self-esteem survey to the students in the program. The survey will be given at the beginning of the eight-week surfing program and again at the end of the program. It is called the Pictorial Scale of Competence and includes a series of pictures for your child to choose from. It will take about 15-20 minutes to take the survey. The data will be analyzed to see whether the surf program affected your child's self-esteem.

Parents will also be asked to complete a pre and post-intervention esteem survey. The survey is the same one that your child will be asked to complete and will take about 15-20 minutes to complete.
Further, a parent/guardian must be present at every surfing lesson in case there is an emergency.

Your child's participation in this study is voluntary. If you choose not to allow your child to participate, or if your child does not choose to participate, there will be no penalty. You or your child may withdraw from participation at any time, with no penalty. The results of the research study may be published, but your child's name will not be used in any way. All results and data will be confidential. Every child's information will be assigned a code number so that individual identities will be known only to the researcher. All identified data will be destroyed at the end of the study. Data collected and consent forms will be stored securely in a locked file cabinet in Dr. Emily Clapham's office in Independence Square II for three years after the completion of the study.

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The possible risks and discomforts of the study are minimal. Surfing, not unlike any other physical activity or adapted physical education class, might cause the subjects to feel out of breath or cause their heart rate to increase especially when the subjects are paddling their surfboards. Also, sometimes when people attempt to catch a wave on a surfboard, they have the possibility of sliding off the board, getting hit by the surfboard and going under the water and there is the remote possibility of drowning. The subjects also will have the risk of getting sunburned from being outside and in the water for 1-2 hours during the summer months. The subjects will be protected by a lifeguard, their own personal surf instructor and additional helpers in the water at all times. The children will each be paired 1:1 with their own surf instructor in the water. Parents and caregivers will also be nearby at all times. Lastly, the participants will be spotted by the researchers and graduate students when they participate in the Berg Balance Scale test to prevent falls and injuries.

The possible benefits of your child's participation is a better understanding of how surfing benefits children of all ages with a variety of special needs. There are many potential benefits of the research to the participants. The potential mental and emotional benefits include: all students will receive one on one attention and instruction. In addition, the ocean is very therapeutic. Children with autism and other disabilities become very overwhelmed by sensory stimuli. The rhythm of the waves provides a calming effect and respite from stimuli. The potential physical benefits include: increasing balance, coordination, flexibility, core body strength, upper body strength and cardiorespiratory endurance. The potential social benefits include: the participants will receive continuous positive feedback working one on one with an instructor. The children will also cheer each other on when they see a peer riding a wave or catching a wave. It is believed that children who enjoy and participate in physical activities will be more likely to maintain a healthy lifestyle.

If you are not satisfied with the way this study is performed, you may discuss your complaints with Emily Clapham, anonymously, if you choose. In addition, if you have questions about your child's rights as a research participant, you may contact the office of the Vice President for Research, 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, Rhode Island, telephone: (401) 874-4328.

If you have any questions about your child's rights as a research participant you may contact me at eclapham@uri.edu or (401) 874-5447. In addition, the researchers are requesting your permission to take photos and videos to be used for educational purposes only. If you provide consent for photos or videos to be taken, please sign below. If you choose not to provide consent for photos or videos your child can still participate in the research.

Thank you very much for your time and consideration in this matter.
Sincerely,
Emily D. Clapham, Ed.D.
E. Clapham

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I do do not

give consent for my child, ______________________________ to participate in the study described above, to be conducted by Dr. Emily D. Clapham. I understand that my child may withdraw from the study at any time with no penalty. I understand that my child's identity will be kept confidential at all times.

I understand that I will be given a copy of this signed consent form, and will also be given a copy of my child's signed assent form.

Parent's name______________________________

Parent's signature______________________________

Date______________

I give permission for the researchers to take photos and videos of my child participating in the research. The photos will only be used for educational purposes only.

Parent's name______________________________

Parent's signature______________________________

Date______________

Researcher's signature E. Clapham

Date 4/3/12

Application Form: URI Adapted Physical Education Program- Summer 2012

Participant Information:

Name: ______________________________

Address: ______________________________

City/State/Zip: ______________________________

Participant's Birthdate: ______________________________

Parents' Names: ______________________________

Daytime Phone: ______________________________

Best time/day to call: ______________________________

Cell Phone: ______________________________

Evening Phone: ______________________________

Emergency Contact: ______________________________

Email Address: ______________________________

Activity Selection: Activity sessions will be from 4:30-5:30pm on Tuesdays and Thursdays beginning May 1 to June 28 with no cost. Please note that activities for the summer will take place at Narragansett Town Beach. Thank you.

Please fill out the following items using as much detail as possible:

1) Please briefly describe the participant's disability and any medical or health problems.

____

____

____

____

____

____

____

2) Based on your child's diagnosis, how would you categorize the participant? Please circle one.

Mild

Mild/Moderate

Moderate

Moderate/Severe

Severe/Profound

3) Please describe the participant's current level of swim ability. Please be specific.

____

____

____

____

4) Please provide the following information for accurate wet suit sizing:

Participant's height: __________

Participant's weight: __________

Participant's shoe size: ________

Participants hand size: (small, medium, large)________

5) Has the participant experienced surfing in the ocean before? If yes, please describe the experience(s) and program:

____

____

____

____

6) Is the participant comfortable being in the ocean with an adult? Please circle one:

Yes or No

7) Does the participant own any surf equipment? Wetsuit or surfboard?

____

ASSENT FORMS

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Child Assent Form for
Catching Waves for Health: Exploring the Benefits of a Surfing Program on Children with Special Needs


Pedometer


Heart Rate Monitor

Dear girls and boys,

We are going to study your physical activity and self esteem this spring and summer by working with you during a surfing program. Your participation in this study is up to you. If you do not wish to participate you do not have to.

You have been told that your parents or guardian (mom, dad or person who takes care of me) have said it is okay for me to participate, if you want to, in a project about physical activity and self-esteem during a surf program. You know that you can stop at any time and this would be alright.

You will be wearing a pedometer and a heart rate monitor while participating in physical activities and recording the amount and level of my physical activity. You will wear the pedometer on your waistband above your knee. The pedometer you will be wearing is about the size of a key. You will wear the pedometer all day long. The only time you will not wear the pedometer is when you are surfing. The heart rate monitor will be worn under your chest,

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above your stomach on your sternum. It looks like a belt you would wear to keep your pants from falling down. ☺

You have also been told that you will participate in fitness testing. The tests will look at how you perform a number of exercises including running, stretches, curl-ups, sit-ups, grip strength, and balancing. Your percent body fat and range of motion will also be measured.

Lastly, you have been told that you will participate in a self-esteem survey. The survey will ask you to look at a few pictures and pick the one that most closely describes how you are feeling.

You understand what is being asked of you and are willing to participate in the surfing program. You will have your own surf instructor while participating in the surfing program.

Name: ____________________

Researcher's signature: C. Clapham

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Assent Form for Children Ages 12-17

My name is Emily Clapham. I am inviting you to take part in a research study because I am trying to learn more about the benefits of surfing on children with disabilities. We will explain the project to you in detail. You should feel free to ask questions. If you have more questions about this study later, please call Emily Clapham, the person responsible for this study, at (401) 874-5447. Please understand that you can quit at any time.

You will be wearing a pedometer and a heart rate monitor while participating in physical activities and recording the amount and level of your physical activity. You will wear the pedometer on your waistband above your knee. You will wear the pedometer all day long. The only time you will not wear the pedometer is when you are surfing. The heart rate monitor will be worn under your chest and above your stomach on your sternum.

You have also been told that you will participate in fitness testing. The tests will look at how you perform a number of exercises including running, stretches, curl-ups, sit-ups, grip strength, and balancing. Your percent body fat and range of motion will also be measured.

You understand what is being asked of you and are willing to participate in the surfing program. You will have your own surf instructor while participating in the surfing program.

The possible risks and discomforts of the study are minimal. Surfing, not unlike any other physical activity or adapted physical education class, might cause you to feel out of breath or cause their heart rate to increase especially when you are paddling your

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surfboards. Also, sometimes when people attempt to catch a wave on a surfboard, they have the possibility of sliding off the board, getting hit by the surfboard and going under the water and there is the remote possibility of drowning. You will also have the risk of getting sunburned from being outside and in the water for 1-2 hours during the summer months. You will be protected by a lifeguard, your own personal surf instructor and additional helpers in the water at all times. You will each be paired 1:1 with your own surf instructor in the water. Parents and caregivers will also be nearby at all times. Lastly, you will be spotted by the researchers and graduate students when you participate in the Berg Balance Scale test to prevent falls and injuries.

The possible benefits of your participation is a better understanding of how surfing benefits children of all ages with a variety of special needs. The potential mental and emotional benefits include: you will receive one on one attention. The potential physical benefits include: increasing balance, coordination, flexibility, core body strength, upper body strength and cardiorespiratory endurance. The potential social benefits include: you will receive continuous positive feedback working one on one with an instructor. You will also cheer each other on when you see a peer riding a wave or catching a wave. It is believed that children who enjoy and participate in physical activities will be more likely to maintain a healthy lifestyle.

Your part in this study is confidential. This means that no one else will know if you were in this study and no one else can find out what answers you gave. We will keep all the records for this study on my computer and they will be protected by a password.

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You might want to talk this over with your parents before you decide whether or not to be in this study. The decision to be part of this research is up to you. You do not have to participate. We will also ask your parents to give their permission for you to take part in this study, but even if your parents say "yes", you can still decide not to do this. If you do decide to participate, you can always drop out of the study at any time. Whatever you decide will not be held against you in any way. No one will be upset if you don't want to participate or even if you change your mind later and want to stop. If you want to quit the study, just let Emily Clapham know at (401) 874-5447 or ask one of your parents to call us.

Remember, you can ask any questions you may have about this study. If you have a question later that you didn't think of now, you can call me at (401) 874-5447 or ask me next time. Would you like to read or hear about this study a second time?

Signing your name at the bottom of this form means that you have read or listened to what it says and you understand it. Signing this form also means that you agree to participate in this study and your questions have been answered. You and your parents will be given a copy of this form after you have signed it.

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THINK BIG WE DO™

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BIBLIOGRAPHY

American College of Sports Medicine's Guidelines for Exercise Testing and Prescription. 2010.

Berg KO, Wood-Dauphinee SL, Williams JI, Gayton D. (1989) Measuring balance in elderly: preliminary development of an instrument. *PhysiotherapyCanada*. 41:304–311.

Cattaneo D. Regola A. Meotti M. (2006) Validity of six balance disorders scales in persons with multiple sclerosis. Disabil Rehabil. 15;28:789-795.

Cattaneo D. Jonsdottir J. Repetti (2007). Reliability of four scales on balance disorders in persons with multiple sclerosis. Disabil Rehabil. 29;24:1920-1925.

Centers for Disease Control. Signs & Symptoms, Autism Spectrum Disorders. (2011) Retrieved 2/21/2013 from: *http://www.cdc.gov/ncbddd/autism/signs.html*.

Cureton, K.J. (1994) Aerobic Capacity. In J.R. Morrow, H.B. Falls, & H.W. Kohl (Eds.), The Prudential FITNESSGRAM technical reference manual (pp. 33-55). Dallas: Cooper Institute of Aerobics Research.

Delaney, T & Madigan, T. (2009) The Sociology of Sports: An Introduction. North Carolina: McFarland.

Diamond, K., & Tu, H. (2008). Relations between classroom context, physical disability and preschool children's inclusion decisions. Journal of Applied Developmental Psychology. 75-81.

Eichstaedt, C. & Lavay, B. (1992) Physical activity for individuals with mental retardation. Champaign, IL: Human Kinetics.

Fernhall B. Tymeson G. (1987) Graded exercise testing of mentally retarded adults; a study of feasibility. Archives of Physical Medicine and Rehabilitation. 63, 363-365.

FITNESSGRAM. Presidential Youth Fitness Program. Human Kinetics. (2013). Retrieved 2/20/2013 from: *http://fitnessgram.net/PresidentsCounciladoptsFitnessgram/*

Fleischmann D., Michalewicz B., Stedje-Larsen E., Neff J., Murphy J., Browning K., Nebeker B., Cronin A., Sauve W., Stetler C., Herriman L., McLay R. (2010) Surf Medicine: Surfing as a Means of Therapy for Combat-Related Polytrauma. JPO Journal of Prosthetics and Orthotics. 12; 23(1):27-29.

Fragala-Pinkham M, O'Neil ME, Haley SM. (2010) Summative evaluation of a pilot aquatic exercise program for children with disabilities. Disabil Health J. Jul;3(3):162-70.

Fragala-Pinkham M, Haley SM, O'Neil ME. (2008) Group aquatic aerobic exercise for children with disabilities. Dev Med Child Neurol. Nov;50(11):822-7.

Granados AC, Agís IF. (2011) Why children with special needs feel better with hippotherapy sessions: a conceptual review. J Altern Complement Med. Mar;17(3):191-7.

Hayden M. (1998) Mortality among people with mental retardation living in the United States: Research review and policy application. Mental Retardation. 36, 345-359.

Hillier S, McIntyre A, Plummer L. (2010) Aquatic physical therapy for children with developmental coordination disorder: a pilot randomized controlled trial. Phys Occup Ther Pediatr. May;30(2):111-24.

Kelly M, Darrah J. (2005) Aquatic exercise for children with cerebral palsy. Dev Med & Child Neuro. 47: 838-842.

Kembhavi, G. Darrah J. Magill-Evans, J. Loomis J. (2002) Using the Berg Balance Scale to distinguish balance abilities in children with cerebral palsy. Pedi Phys Ther. 92-99

Koury, J (1996). Aquatic Therapy Programming. Champaign, IL: Human Kinetics.

Leger, L.A., Mercier, D., Gadoury, C., & Lambert, J. . (1998) The multistage 20 metre shuttle run test for aerobic fitness. Journal of Sport Sciences. 6, 93-101

Liao H-F, Jeng S-F, Lai J-S, et al. (1997) The relation between single standing balance and walking function in children with spastic diplegic cerebral palsy. Dev Med chil eurol. 39:106-112.

Liston, R. Brouwer B. Reliability and validity of measures obtained from stroke patients using the Balance Master. Arch Phys Med Rehabil. 1996;77:425-430.

Maslow, A. (1954) Motivation and personality. New York: Harper

Mendez-Villanueva A., Bishop D. (2005) Physiological Aspects of Surfboard Riding Performance. Sports Medicine. Volume 35, Number 1, pp. 55-70(16).

Montgomery PG, Green DJ, Etxebarria N, Pyne DB, Saunders PU, Minahan CL. (2009)Validation of heart rate monitor-based predictions of oxygen uptake and energy expenditure. J Strength Cond Res. Aug;23(5):1489-95.

Murphy, N.A. Carbone, P.S. & Council on Children with Disabilities. (2008) Promoting the participation of children with disabilities in sports, recreation, and physical activities. PEDIATRICS. 121, 1057-1061.

Okagaki, L., Diamond, K. E., Kontos, S. J., & Hestenes, L. L. (1998) Correlates of young children's interactions with classmates with disabilities. Early Childhood Research Quarterly. 67-86.

Patterson, P., Wiksten, D.L., Ray, L., Flanders, C., & Sanphy, D. (1996) The validity and reliability of the back saver sit and reach test in middle school girls and boys. Research Quarterly for Exercise and Sport. 67, 448-451.

Peganoff S. A. (1984) The use of aquatics with cerebral palsied adolescents. Am J Occup Ther. 38: 469-473.

Piek J. P, Dworkin M, Barrett N, Coleman R. (2000) Determinants of self-worth in children with and without developmental coordination disorder. International Journal of Disability, Development and Education. 47(3), 259-272.

Plowman, S.A., & Corbin, C.B. (1994) Muscular strength, endurance, and flexibility. In J.R. Morrow, H.B. Falls, & H.W. Kohl (Eds.), The Prudential FITNESSGRAM technical reference manual (pp. 73-100). Dallas: Cooper Institute of Aerobic Research.

Retarekar R, Fragala-Pinkham MA, Townsend EL. (2009) Effects of aquatic aerobic exercise for a child with cerebral palsy: single-subject design. Outpatient Physical Therapy, Spaulding Rehabilitation Hospital, Boston, Massachusetts, USA. Pediatr Phys Ther.

Rimmer, J. H., Riley, B., Wang, E., Rauworth, A., & Jurkowski, J. (2004) Physical activity participation among persons with disabilities. American Journal of Preventative Medicine. 26-30.

Safrit, M.J., & Wood, T.M. (1995) Introduction to measurement in physical education and exercise science (3rd ed.). St. Louis: Mosby.

Short, F.X., & Winnick, J.P. (1999) The Fitness Challenge: Software for the Brockport Physical Fitness Test [computer software]. Champaign, IL: Human Kinetics.

Troiano RP, Berrigan D, Dodd KW, Mâsse LC, Tilert T, McDowell M. (2008) Physical activity in the United States measured by accelerometer. Med Sci Sports Exerc. Jan;40(1):181-8A.

Winnick, J.P. & Short, F.X. (1999) The Brockport Physical Fitness Test Manual. Human Kinetics.

Wurmser, M. (2010) Autism Spectrum Disorder's Site.

World Health Organization. (2010) Global Recommendations of Physical Activity for Health. Retrieved 2/21/2013 from *whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf*

World Health Organization. (2012) Global Strategy on Diet, Physical Activity and Health: Physical activity and young people. Retrieved 2/21/2013 from *http://www.who.int/dietphysicalactivity/factsheet_young_people/en/index.html*

Yilmaz, I., Yanardag, M., Birkan, B., Bumin, G. (2004) Effects of swimming training on physical fitness and water orientation in autism. Pediatrics International, 46, 624-626.