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## An Examination between Swimming Ability, Gender, and Race- An Exploratory Investigation

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*An Examination between Swimming Ability, Gender, and Race -  
An Exploratory Investigation*

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in  
Department of Health and Human Sciences

By  
Laynie Brown  
Under the Mentorship of Dr. Daniel Czech

ABSTRACT

One of the leading causes of unintentional death worldwide is drowning. From 2005-2009, an estimated 3,107 people in the United States over the age of fifteen died from drowning (Peden, Oyegbite, & Ozanne-Smith, 2008). Research has found higher amounts of drowning deaths to be males than females and African-American than Caucasian (Saluja et al., 2005). However, no significant differences have been found in real or perceived water competency between gender or age groups (Moran et al., 2012). Thus, the purpose of this study was to examine ability to swim between gender, race, and school classification of college students. Quantitative data was collected via SurveyMonkey.com including demographic information and self-reported swimming ability. Independent t-tests were run to examine significant differences in gender, race, and perceived swimming ability. Results will be examined from a therapeutic outlook and how they will be able to benefit hydrotherapy programs.

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April 2014  
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## Introduction

Spending time in the water is a favored American warm weather pastime, for college students. With recent totals of college students visiting Panama City Beach during the spring break months surpassing 350,000, the words college student have become synonymous with the words water, beach, and pool (Ward, 2011). However, many of those same college students do not have the skill set to survive in the water. In the year 2002 alone, over 300 individuals in the United States ages 20 to 24 died from drowning (Saluja et. al 2005). Between the years 2005 and 2009, there was an estimated annual total of 3,107 fatal cases and 1,718 nonfatal cases of drowning for individuals over the age of 15 ("Drowning - United States, 2005-2009",2012). A base water competency skill set can greatly improve a person's chance of survival in water and their confidence to do so. As we age, our bodies become less equip to deal with stressful situations such as being in the water, therefore it is important to have a basis of skills from an early age.

Young adults sustain injuries as much if not more than any other population age grouping. An innovative therapy technique that has gained exponential popularity in recent years is hydrotherapy or aquatic therapy (Kittell, 2006). This type of therapy involves the use of water, normally requiring the patient to be at least partially submerged in a hydrotherapy pool. Water is a viable means of enhancing rehabilitation programs because it applies a variable accommodating resistance to the applied muscular forces and because of this the probability of exceeding tissue tolerance is reduced thus reducing the risk of further injury during exercise (Prins, 2010). It also allows the therapist to induce progressive resistance training while concurrently challenging postural stability (Kittell, 2006). Because of this, hydrotherapy provides various therapeutic benefits such as improved circulation, strength, endurance, range of motion, balance and coordination, and muscle tone ("Spotlight on Aquatics", 2001). Furthermore, aquatic therapy and immersion in water affects the lymph system, the digestive system, decreases edema and joint compression, improves immune system response and provides relaxation for the patient (Osborn, 2005).

Because hydrotherapy requires immersion, this can pose difficulties to both the therapist and the patients if the patient is not comfortable controlling their body in the water. Therefore, a person who has previous aquatic experience may be expected to begin aquatic physical therapy with less apprehension than someone unfamiliar with the water (Prins, 2010). Consequently, knowing which demographic group of people typically have more swimming ability can be a useful tool for a therapist going into a session with a new patient.

The purpose of this study is to examine ability to swim between gender, race, and school classification of college students. There has been evidence of Black non-Hispanic males and females with higher drowning rates than those of White non-Hispanic males and females (Saluja et. al 2005). This study seeks to provide information on perceived swimming ability and the differences among a select group of the population. The data will be analyzed quantitatively and gathered via individual surveys. With concrete evidence of demographic differences, therapists could be able to better predict and address the needs of hydrotherapy patients.

## Methods

### Procedure

The design of this study was a quantitative, quasi-experimental, cross-sectional descriptive study. A 31-item questionnaire given via the Survey Monkey program was used to gather data. The survey was presented to students of a midsize southeastern United States university who were enrolled in a required physical activity class during the fall semester of 2012. During that time, a total population of 3,825 students were registered for 136 sections of activity classes. Students read the informed consent and gave passive consent when they completed the survey. Survey completion occurred during the last two weeks of the semester and was voluntary. Students were verbally recruited by their instructors with a bonus grade incentive. Surveys were uploaded to the course's online learning management system and was completed by 2,318 (60.6%) of the 3,825 total students enrolled with no attempt made to contact non-responders. Demographic breakdown of participants, which reflect that of the student population at the university, is expressed in Table 1. Out of students who took the survey 56.7% (n=1294) were female while 43.3% (n=987) were male. Concerning race demographics, 63.3% reported being White (n=1447) followed by Black (27.1%, n=618) and "other" (9.4%, n=216). The "other" category contained all other races/ethnic groups (Asian, Hispanic, Biracial and Other).The survey contained demographic questions as well as questions regarding course satisfaction and health behaviors such as physical activity, sleep, and nutrition. Contained in the survey was one main self-reported question this study focused on concerning ability to swim. The participants were asked to rate their ability to swim on a scale of 1 to 4. Those who answered 1 were grouped as cannot swim, those who answered 2-3 were grouped as can swim a little, and those who answered 4 were grouped as can swim efficiently. Furthermore, the study was approved by the Human Subjects Institutional Review Board of the university.

### Analysis

Variations in this study were reported by mean and standard deviation of each demographic independent variable (race, gender, and school classification). The SPSS program (version 17.0) was used to calculate the data. Alpha levels were set at  $p < 0.05$  and were reported with 95% confidence intervals.

## Results

The total number of valid entered surveys for race, gender and school classification were 1728, 1724 and 1726 respectively. An invalid test consisted of any missing answers. As evident in Table 1, more than half of the participants were considered White (68.1%) in race, with Black participants following (21.9%) and participants considered Other (9.9%) making up the lowest percentage. The gender ratio was the most even of the three variables tested with males making up slightly over half (50.5%) and females slightly lower (49.4%) (Table 2). The last variable tested was school classification. The greatest number of participants represented the Sophomore class (36.2%) followed by Seniors (24.3%), Juniors (23.7%) and then Freshmen (15.8%) (Table 3).

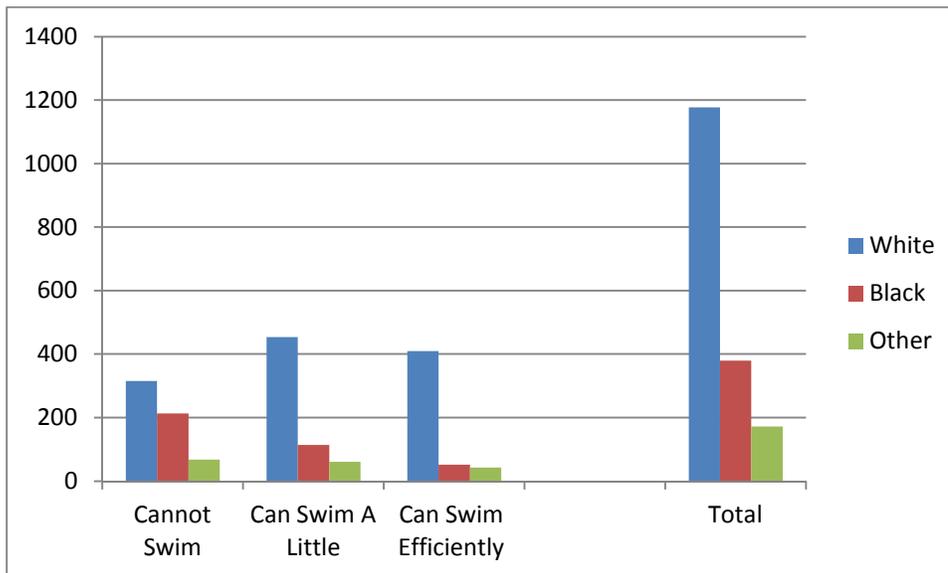
### Race

According to the survey answers and the race demographic information presented, our study does show a race difference between swimming ability levels. Out of the participants who described themselves as White, the largest percentage of those also described themselves as being able to swim a little (38.5%) followed by being able to swim efficiently (34.7%) (Table 1). In contrast, the largest percentage of those who described themselves as Black answered cannot swim (56.2%) and can swim a little (30.1%) respectively, as did those who described themselves as Other (39.5% and 35.5%) (Table 1). The White participants exhibited the highest percentage of participants who can swim efficiently (34.7%), followed by the Other participants (25%), and then the Black participants (13.7%) (Table 1). The highest percentage of participants who answered cannot swim was represented by the Black participants (56.2%), followed by the Other participants (39.5%), then the White participants (26.8%) (Table 1). The highest percentage of any ability to swim, defined as can swim a little plus can swim efficiently, was shown by the White participants (73.2%) followed by the Other participants (60.5%) with the Black participants (43.8%) having the lowest percentage (Table 1). Therefore, our study showed that people who fall under the White race category do statistically have more swimming ability than other races. Figure 1 displays these results graphically.

Table 1. Ability Recode Race Cross Tabulation

Ability	White	Black	Other	Total
Cannot Swim	315 (26.8%)	213(56.2%)	68(39.5%)	596
Can Swim A Little	453(38.5%)	114(30.1%)	61(35.5%)	628
Can Swim Efficiently	409(34.7%)	52(13.7%)	43(25.0%)	504
Total	1177	379	172	1728

Figure 1. Swimming Ability by Race



## Gender

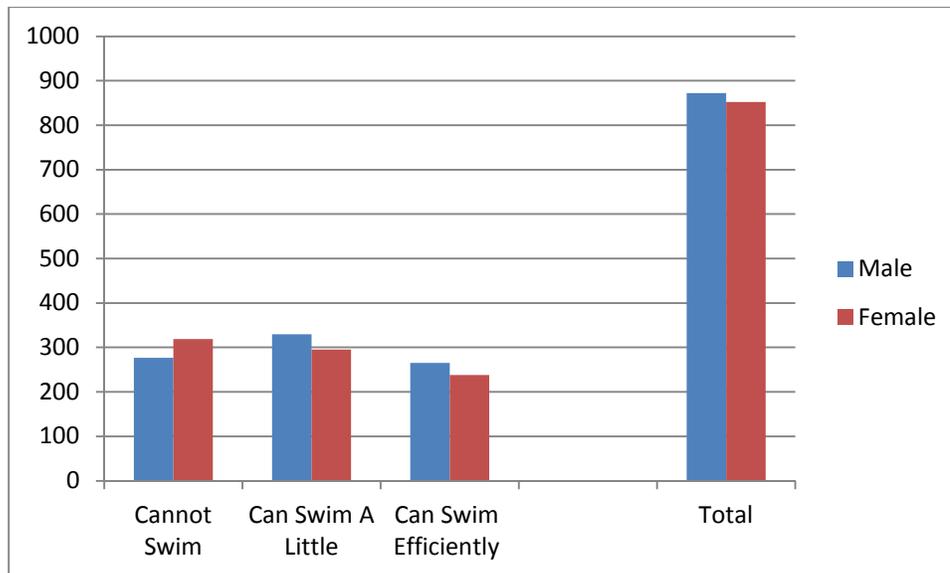
Gender distribution was the most even of the variables tested with 50.5% being male and 49.5% female. There was also not as significant a difference between swimming ability in gender as was shown in race. However, it was shown that a higher percentage of females (37.4%) expressed the inability to swim than males (31.8%) (Table 2). Males also exhibited a slightly higher percentage of those who can swim efficiently (30.4%) as opposed to females (27.9%) (Table 2). As far as total ability to swim, defined as can swim a little plus can swim efficiently, men (68.2%) also have the advantage over

women(62.6%). Therefore, our study showed that men have slightly better swimming ability than women. The data from Table 2 is represented in graphically in Figure 2.

Table 2. Ability Recode Gender Cross Tabulation

Ability	Male	Female	Total
Cannot Swim	277(31.8%)	319(37.4%)	596
Can Swim A Little	330(37.8%)	295(34.6%)	625
Can Swim Efficiently	265(30.4%)	238(27.9%)	503
Total	872	852	1724

Figure 2. Swimming Ability by Gender



### School Classification

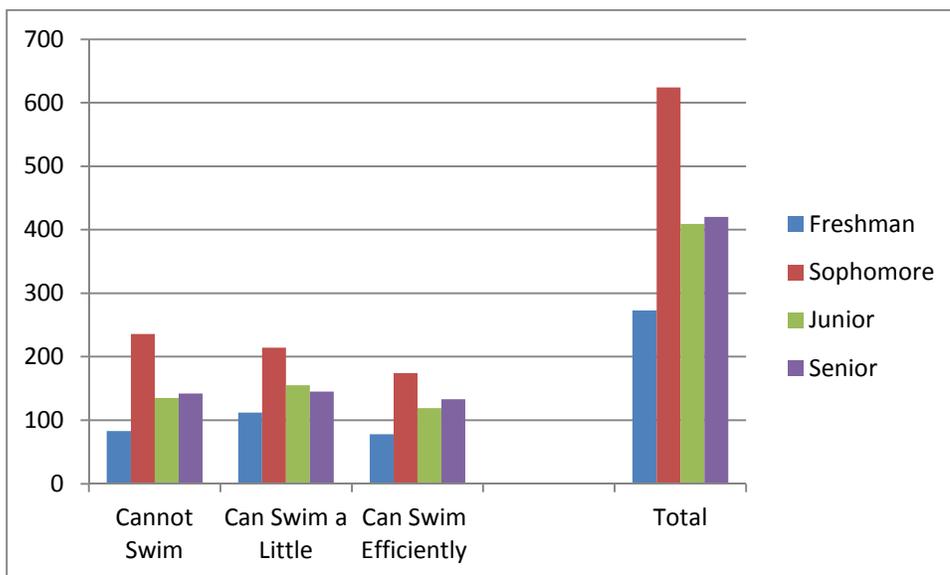
There was considerable differences between school classifications and swimming ability. The Sophomore (37.8%) class showed the largest percentage of participants who answered cannot swim followed by the Seniors (33.8%), Juniors (33.0%) and then Freshmen (30.4%) (Table 3). The Senior (31.7%) class showed the greatest percentage of

participants who could swim efficiently trailed by the Juniors (29.1%), Freshmen (28.6%) and then the Sophomores (27.8%) (Table 3). The Sophomore class had the highest percentage of participants who answered that they cannot swim and the lowest percentage of those who answered that they can swim efficiently. Thus, it can be inferred that this range of participants has the lowest swimming ability out of the four school classifications. This inference is supported by the data concerning total swimming ability, defined as can swim a little plus can swim efficiently. The Freshmen class participants (69.6%) have the highest percentage followed by the Juniors (66.9%), Seniors (66.2%) and then the Sophomores (62.2%) (Table 3). The class of school data is presented graphically in Figure 3.

Table 3. Ability Recode Class of School Cross Tabulation

Ability	Freshman	Sophomore	Junior	Senior	Total
Cannot Swim	83(30.4%)	236(37.8%)	135(33.0%)	142(33.8%)	142
Can Swim a Little	112(41.0%)	214(34.3%)	155(37.9%)	145(34.5%)	626
Can Swim Efficiently	78(28.6%)	174(27.9%)	119(29.1%)	133(31.7%)	504
Total	273	624	409	420	1726

Figure 3. Swimming Ability by School Classification



## Discussion

Our study shows that for college-aged young adults there are differences in self-reported ability to swim between the population demographics of race, gender and school classification. The largest statistical variation is present within race and the smallest amount of variation was seen between school classification. Previous studies have shown that there are differences in drowning rates between races of this age group. One particular study found that Black non-Hispanics have the highest drowning rates of any race between the ages of 5-24 (Saluja et al., 2006). The results of this study parallel the results of our study that show racially Black individuals having the lowest rate of swimming ability throughout the three race categories. One can infer that if drowning rates are higher within a particular group swimming ability rates for that particular group would also be lower. Our outcome can help to verify this inference and further explain the results of the drowning study. There has also been previous research that has exhibited differences in drowning rates between sexes showing men with higher rates of drowning than women (Howland et al., 1996). The results of our study show that men of this age bracket reported higher rates of swimming ability thus contradicting the inference that higher drowning rates indicate lower swimming ability rates. However, there could be an alternative explanation contributing to males demonstrating higher rates of swimming ability. One of the foreseen difficulties and limitations of our study is the fact that males tend to overestimate their ability and place themselves in greater aquatic setting risk situations than females (Howland et al., 1996). This could deter their swimming competency survey results making them report higher than their actual swimming ability. Another possible limitation of the study is that the survey question used to collect data on participants swimming ability level was a scaled question. Because of this, there may be variation in the answers, misinterpretation or confusion. A participant could overestimate or underestimate their ability to swim or not be clear as to how the scale corresponds to level of ability. To correct for this, we used multiple numbers on the scale to represent the same level of ability such as those who answered 2-3 on the scale were group as can swim a little.

The results of this study can provide clinical benefits from the standpoint of aquatic therapy. Aquatic therapy has become an increasingly popular means of therapy for elite athletes, thus it is also becoming a viable means of therapy for younger adults where in the past it has been used mostly on the elderly population (Kim et al., 2010). A comfortable swimming ability helps patients to be more comfortable with aquatic therapy and therefore can benefit their treatment program both by decreasing recovery time and difficulty. Therefore, the patient's swimming ability level can be a major determining factor as to where the therapist decides to begin the rehabilitation program. Patients who have a lower swimming ability will need more time to acclimate to an unfamiliar or

unnerving environment. Before a therapeutic program can begin, the therapist must evaluate the patient's needs and develop a planned program. With the demanding schedules that most therapists undertake, evaluation and paperwork time can make up a major portion of the workload that could be better spent increasing one-on-one time with patients or researching and developing their therapeutic techniques. Results such as the ones shown in this study, can help therapists to better predict their client's needs before even meeting and evaluating the patients themselves. For example, if a patient's chart shows that the patient is a White male who is a Senior in college, he most likely possesses enough swimming ability to be comfortable in an aquatic therapy regimen. Therefore, the therapist can already have a program selected for this patient before evaluation and then proceed to confirm or deny the use of that program based on the evaluation information instead of using it to then develop the program like the current process.

Further research should be considered to confirm the results of this study. A study using a larger more varied population would be beneficial to further the impact of the results. An area that remains to be further explored is that of the swimming abilities of the older population. Research on the demographics of drowning victims has been prevalent but additional research on swimming ability and demographics is lacking.

### Conclusion

Swimming ability of the college-aged population of a Southeastern University in the United States does vary between the population demographics of race, gender and school classification. Swimming ability differences can be beneficial to therapists performing aquatic therapy when designing rehabilitation programs for potential patients. Therapists should be aware that further research is needed to confirm and expand these results in order to generalize them to the population as a whole.

## References

1. Drowning - United States, 2005-2009. (2012). MMWR: Morbidity & Mortality Weekly Report, 61344-347.
2. Howland, J., Hingson, R., Mangione, T. W., Bell, N., & Bak, S. (1996). Why are Most Drowning Victims Men? Sex Differences in Aquatic Skills and Behaviors. *American Journal Of Public Health*, 86(1), 93.
3. Kim, E., Kim, T., Kang, H., Lee, J., & Childers, M. (2010). Aquatic versus land-based exercises as early functional rehabilitation for elite athletes with acute lower extremity ligament injury: a pilot study. *PM & R: The Journal Of Injury, Function, And Rehabilitation*, 2(8), 703-712. doi:10.1016/j.pmrj.2010.03.012
4. Kittell, S. (2006). In the Swim. *Rehab Management: The Interdisciplinary Journal Of Rehabilitation*, 19(10), 28-30.
5. Moran, K., Stallman, R., Kjendlie, P., Dahl, D., Blitvich, J. D., Petrass, L. A., & ... Shuji, S. (2012). Can You Swim? An Exploration of Measuring Real and Perceived Water Competency. *International Journal Of Aquatic Research & Education*, 6(2), 122-135.
6. Osborn, K. (2005). Water, Watsu, and Wellness. *Massage & Bodywork*, 20(5), 18-27.
7. Prins, J. J. (2010). Aquatic Training in Rehabilitation and Preventive Medicine. *Xith International Symposium For Biomechanics & Medicine In Swimming*, (11), 28-29.
8. Saluja, G., Brenner, R., Trumble, A., Smith, G., Schroeder, T., & Cox, C. (2006). Swimming pool drownings among US residents aged 5-24 years: understanding racial/ethnic disparities. *American Journal Of Public Health*, 96(4), 728-733. doi: <http://dx.doi.org/10.2105/AJPH.2004.057067>
9. Spotlight on aquatics. (2001). *PT: Magazine of Physical Therapy*, 9(1), 81.
10. Thein, J. M., & Brody, L. T. (1998). Aquatic-based rehabilitation and training for the elite athlete. *Journal Of Orthopedic & Sports Physical Therapy*, 27(1), 32-41.

Appendix A:

Annotated Bibliography

1. Drowning - United States, 2005-2009. (2012). MMWR: Morbidity & Mortality Weekly Report, 61344-347.

I chose this source to illustrate the number of deaths due to drowning yearly in the United States. Therefore showing how important swimming ability can be to survival. I decided that this would be the best source to use because it was the most recent multiple year reliable source I found.

2. Howland, J., Hingson, R., Mangione, T. W., Bell, N., & Bak, S. (1996). Why are Most Drowning Victims Men? Sex Differences in Aquatic Skills and Behaviors. *American Journal Of Public Health*, 86(1), 93.

I chose this source because it showed a difference between genders in drowning victims and thus swimming ability. This is one of the components I will be looking at with my study and hoping to show that there is a difference in gender swimming ability of college students. I will use this as evidence that gender differences have been found in certain populations. It also poses a potential limitation for this study. It references that males tend to overestimate their abilities when asked about them. Therefore, since we have a scale survey the males in the group may have added a number or two to their actual swimming ability level.

3. Kim, E., Kim, T., Kang, H., Lee, J., & Childers, M. (2010). Aquatic versus land-based exercises as early functional rehabilitation for elite athletes with acute lower extremity ligament injury: a pilot study. *PM & R: The Journal Of Injury, Function, And Rehabilitation*, 2(8), 703-712. doi:10.1016/j.pmrj.2010.03.012

This source shows how aquatic therapy benefits elite athletes. It also shows that most of these elite athletes are in the college age bracket. Therefore, I planned to use it to illustrate how aquatic therapy can benefit young adults just as much as older adults. In addition, this would mean that swimming ability would also help to benefit their rehabilitation program.

4. Kittell, S. (2006). In the Swim. *Rehab Management: The Interdisciplinary Journal Of Rehabilitation*, 19(10), 28-30.

I chose to include this source in order to illustrate the rising popularity of aquatic therapy. It also shows the benefits of aquatic therapy on the body and injuries. This source also provides a references that aquatic therapy is being used to treat more athletic injuries and thus a younger adult age bracket.

5. Moran, K., Stallman, R., Kjendlie, P., Dahl, D., Blitvich, J. D., Petrass, L. A., & ... Shuji, S. (2012). Can You Swim? An Exploration of Measuring Real and Perceived Water Competency. *International Journal Of Aquatic Research & Education*, 6(2), 122-135.

This source pertains to perception of swimming ability. In this study we ask students to perceive their ability to swim on a scale system. This source could help me show how accurate their answers tend to be. This study is a good reference especially for use in my study because the age group tested is students between the ages of 17-29 which I will be able to relate easily to my study using students from ages around 18-23.

6. Osborn, K. (2005). Water, Watsu, and Wellness. *Massage & Bodywork*, 20(5), 18-27.

This is another source that shows the benefits of water and water submergence on the human body. Therefore, it also helps to support aquatic therapy programs as a beneficial type of rehabilitation.

7. Prins, J. J. (2010). Aquatic Training in Rehabilitation and Preventive Medicine. *Xith International Symposium For Biomechanics & Medicine In Swimming*, (11), 28-29.

I chose this source because it helps to illustrate how the aquatic therapy benefits patients and how exactly the human body reacts in water, for example muscular endurance. It also demonstrates what particular types of injuries can best be helped by aquatic therapy. Most of this information I have decided to use in my introduction and discussion to exemplify just how aquatic therapy works and is helpful. This source also alludes to the fact that patients who are comfortable in the water have more success in aquatic therapy programs and thus feel more comfortable with the process. This is an important fact for my study because I plan to look at the results of swimming ability from an aquatic therapy standpoint and why it matters to therapists.

8. Saluja, G., Brenner, R., Trumble, A., Smith, G., Schroeder, T., & Cox, C. (2006). Swimming pool drownings among US residents aged 5-24 years: understanding racial/ethnic disparities. *American Journal Of Public Health*, 96(4), 728-733. doi: <http://dx.doi.org/10.2105/AJPH.2004.057067>

This source shows that there are racial differences between drowning rates of young adults. It shows that Black non-Hispanic males have the highest drowning rates among this age bracket. The goal for my study is to examine swimming ability. While this source examines drowning, I am hoping the results will parallel and show some differences. Because their drowning rates are higher logically their swimming rates should also be higher, however this may not be the case once data is analyzed. This source does show that there is some prior research concerning the topic and there have been racial differences.

9. Spotlight on aquatics. (2001). *PT: Magazine of Physical Therapy*, 9(1), 81.

This source shows which type of patients and which types of injuries benefit from aquatic therapy. It also explains how aquatic therapy has gained popularity. I chose this source as another reference for aquatic therapy benefits and practices.

10. Thein, J. M., & Brody, L. T. (1998). Aquatic-based rehabilitation and training for the elite athlete. *Journal Of Orthopedic & Sports Physical Therapy*, 27(1), 32-41.

This source describes aquatic therapy and how it benefits elite athletes and their high levels of performance and need for fast rehabilitation programs. It talks about how aquatic therapy can provide athletes with "active rest". I chose to use this source because it also shows that aquatic therapy is being used by the population of people I will be studying.

## Appendix B:

### Purpose

The purpose of this study was to examine ability to swim between gender, race, and school classification of college students and to examine results from an aquatic therapy standpoint.

### Research Question

How does young adult swimming ability differ over population demographics such as gender, race, and school grade classifications?

### Delimitations

Study focuses on one survey question.

Participants used were volunteers.

Study had a larger sample size with differing demographics reflecting those of the university as a whole.

Participants were all college students of a Southeastern United States university.

### Limitations

Research has shown that males tend to overestimate their abilities, thus they could possibly overestimate their answer to the survey question.

Survey question is a scale question allowing for some variation and may cause confusion.

### Definitions

Swimming ability in this study is defined as the ability to be comfortable in the water. The participant does not need to know certain strokes to be constituted as a swimmer. The minimum ability to swim is to be able to keep from drowning.

