AQUATIC EXERCISE MANUAL FOR PREGNANCY

A graduate project submitted in partial fulfillment of the requirements
For the degree of Master of Science
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By
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ABSTRACT

AQUATIC EXERCISE MANUAL FOR PREGNANCY

By

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Master of Science in Kinesiology

Moderate to vigorous intensity exercise is recommended throughout pregnancy. But, women must be informed of the potential risks and problems associated with exercise during pregnancy. They must consult their clinicians about whether or not to exercise and about the form of exercise that is both safe and effective for them. An aquatic exercise offers a fun, safe and effective alternative to land-based exercises for pregnant women. An aquatic exercise helps pregnant women to stay physically active, and it is not detrimental to the health of the mother or the fetus. Research has shown that aquatic exercise during pregnancy reduces edema, arterial pressure and back pain while also helping to control body weight. Previous research has provided exercise guidelines and exercise protocols for land-based exercises for pregnant women. Despite the advantages and benefits of aquatic environment, no evidence-based aquatic exercise guidelines have been developed to provide this information to clinicians, local aquatic facilities and pregnant women. The purpose of this project is to introduce aquatic exercises and guidelines for pregnant women throughout pregnancy. It can provide reasonable exercise guidelines for clinicians, local aquatic facilities, and pregnant women.
INTRODUCTION

Pregnancy

Pregnancy usually lasts 40 weeks from the beginning of the first day the menstrual cycle is skipped. These 40 weeks are divided into three trimesters which are determined by the number of weeks since insemination. The first trimester is from weeks 0 to 13, the second trimester is from weeks 14 to 27, and the third trimester is from weeks 28 to 42. Each stage lasts for a total of 3 months and is marked by development in the woman’s abdomen.

The first trimester is the most important period for the fetus to grow as the fetus develops all of its limbs and internal organs during this time. While this is taking place, major physiological changes take place that are often complicated by nausea, vomiting, and excessive fatigue (Blackburn, 2007). Women also may experience more frequent urination and be more sensitive to the smell of certain foods. It also is common for women to crave foods that are not part of their usual diet. (American College of Obstetricians and Gynecologists, 2003).

In the second trimester, women may start to feel more energetic, and the nausea and vomiting may start to subside. Enlargement of the abdomen starts to occur, skin darkens, and women may feel warm and flushed. Appetite begins to increase tremendously to provide nutrients for the growing fetus. Heart rate increases along with blood volume throughout the body (American College of Obstetricians and Gynecologists, 2003).

In the third (last) trimester, women find it hard to get comfortable. The baby starts to kick the abdomen, lower back pain starts to occur, and stretch marks develop on the
abdomen and breasts. In the 36th week, the baby’s head drops into the pelvis releasing pressure in the abdomen which may help the woman breathe easier. This placement of the fetus is essential for having a natural, safe birth (American College of Obstetricians and Gynecologists, 2003).

Over the course of these three trimesters, the average woman should gain 25-35 pounds. Women who are overweight should put on less weight than average-weight women. A healthy weight gain throughout pregnancy should be to gain 3-5 pounds during the first and second trimesters and then to gain 1-2 pounds each week during the last trimester. While pregnant, a woman needs to eat a balanced, nutritional diet and to eat frequent, small meals throughout the day. This should provide proper nutrients to the growing fetus (American College of Obstetricians and Gynecologists, 2003).

Finally, the mother should not smoke and she should not consume medications, drugs, alcohol, large amounts of caffeine, or artificial sweeteners during pregnancy as these substances may pass from the mother to the fetus and cause harm (American College of Obstetricians and Gynecologists, 2003).

Physical Activity and Exercise

The National Institutes of Health (2015) describes physical activity as the movement of the body that requires more energy than resting or sleeping. Some examples of physical activity include dancing, swimming, and yoga. The NIH also explains that exercise is a form of physical activity that is planned and structured. Some examples of exercise include lifting weights, an aerobics class, and participation in a sport such as baseball or soccer. Both physical activity and exercise are good for the heart and lungs as well as for staying healthy.
Aquatic Exercise

The Aquatic Physical Therapy Section of the American Physical Therapy Association (2015) states that aquatic exercise utilizes water as an environment for performing fitness-related and general health-related exercises. Aquatic aerobic exercise is a fun and effective way to stay physically active during pregnancy. It produces many positive physical and mental benefits, it is enjoyable, and it is not detrimental to the health of the mother or of the fetus.

Exercise while Pregnancy

A woman’s nutrition, exercise and health during pregnancy have important implications for pregnancy outcome (National Institute of Health and Excellence, 2015). Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) recommend 30 minutes or more of moderate-to-intense physical activity – preferably 7 days a week – for the general population. The CDC and the ACSM also have found that doing 20-60 minutes of exercise 3-5 days per week results in higher participation in physical activity. With due precautions, education and input from their clinicians, pregnant women should follow these exercise guidelines as well (Pate et al., 1995). In addition, exercise guidelines specific to pregnancy have been published by the American College of Obstetrics and Gynecologists. They define moderate-to-intense physical activity as bodily movement that is produced by skeletal muscles that require energy expenditure. Such exercise is important during pregnancy because it can help pregnant women to: maintain a healthy body weight, maintain cardiovascular fitness, develop muscle strength and endurance, improve posture, experience relief from minor discomforts, and have an easier labor (Pate et al., 1995). In addition, obesity in pregnancy
is one of the most challenging problems and is associated with pregnancy outcomes for both mother and child (Norman et al, 2011, Reynolds, 2013).

Although pregnant women should exercise with the same frequency and relative intensity as the general population, there are activities that increase the risk of falls and abdominal trauma so these should be avoided. Artal et al (2003) found activities such as downhill skiing, scuba diving, gymnastics, horseback riding, racquet sports or activities that put excessive strain on the joints, such as jogging and tennis, should be avoided. Participation in high-contact recreational sports also should be avoided since the contact can be detrimental to the fetus. These activities include such sports as ice hockey, soccer, and basketball (Camporesi, 1996).

In addition, if cleared to participate in an exercise program by their clinicians, pregnant women should be monitored – and should monitor themselves – before, during and after exercise. Artal et al (2003) found that complications may arise that could exclude them from continuing to exercise safely during pregnancy (2003). Hammer et al (2000) also researched and found that monitoring of exercise is important. Their research determined that pregnant women who exercise should: avoid hypoglycemia, not eat an hour before exercise, stay hydrated, wear appropriate clothing, alternate hard training days, and wear appropriate footwear. They also found that fetal and maternal heart rates should be checked (2000).

Furthermore, the Valsalva maneuver should be avoided at all costs during exercise. This is the holding of the breath and/or not breathing properly. Holding the breath increases the heart rate and blood pressure and decreases uterine perfusion (Wang & Apgar, 1998). Increasing heart rate and blood pressure may be detrimental to the fetus.
Finally, a compiled list of warning signs that should cause a pregnant woman to terminate an exercise session would be: vaginal bleeding, dizziness, headaches, chest pain, muscle weakness, calf pain or swelling, preterm labor, decreased fetal movement and amniotic fluid leakage (Schoenfeld, 2011).

**Exercise Contraindications in Pregnancy**

One of the biggest concerns most women have while pregnant is miscarriage. A miscarriage is the loss of the fetus before the 20th week of term. There is no association between physical activity and a miscarriage (Latka, Kine, & Hatch, 1999). In fact, regular exercise in moderate-to-vigorous intensity is recommended throughout pregnancy. But, women must be informed of the potential risks of exercise and warned of any problems. They must consult their clinician in order to make educated decisions about whether or not to exercise during their pregnancy and about the form of exercise that is both safe and effective for them during their pregnancy.

There are, however, some absolute contraindications against exercise in pregnancy. They include: significant heart disease, restrictive lung disease, incompetent cervix, risks for premature labor, vaginal bleeding, ruptured membranes, pre-eclampsia/pregnancy-induced hypertension, and placenta previa after 26 weeks. Pre-eclampsia occurs when a pregnant woman develops high blood pressure along with high amounts of protein in the urine after the 20th week of pregnancy. Placenta previa is the leading cause for vaginal bleeding. It occurs when the placenta partially or wholly covers the mother’s cervix. A list of relative contraindications for exercise during pregnancy, include: severe anemia, unevaluated cardiac arrhythmia, chronic bronchitis, type 1 diabetes, morbid obesity, being extremely overweight, having a history of an extreme
sedentary lifestyle, hypertension, orthopedic limitations, seizure disorders, being a heavy smoker, and having poorly controlled hyperthyroidism (Schoenfeld, 2011).

Activity Concerns in Pregnancy

Stressful work environments are one area of concern during pregnancy. Physically stressful workloads such as strenuous lifting, long hours of standing, and exposure to loud noises should be discussed with a clinician. Emotionally/psychologically stressful work-place situations need to be discussed as well. Workplace stress of any kind is problematic in and of itself but may also lead to the kind of exhaustion that prevents the pregnant woman from exercising so this compounds the problem. The correlation between workplace stress and lack of exercise in pregnant women has not yet been thoroughly researched (Hammer, Perkins, & Parr, 2000).

Joint-related injuries also are a concern during pregnancy. There is an increase in joint laxity during pregnancy that is caused by an increased secretion of the hormone relaxin (Artal et al., 2003). Relaxin is secreted by the ovaries and the placenta during pregnancy. During pregnancy, relaxin is at its highest peak in the first trimester to prevent childbirth. Though relaxin is essential for the healthy development of the fetus, it makes the mother’s joints less stable. This may lead to damage in the muscles, tendons, and/or ligaments. Resistance training has been shown to increase connective tissue strength which can reduce injury risk for pregnant women (Fleck, & Falkel, 1986).

Body positioning is another concern that arises with pregnancy. The supine position with gravity should be avoided since it obstructs venous return from the uterus to the vena cava (Avery, Stocking, Tranmer, Davies, & Wolfe, 1999). During the third trimester of pregnancy, forward hip/waist flexion also should be avoided. The woman’s
uneven weight distribution makes this movement difficult and places stress on the lumbar region, which can cause dizziness and/or heartburn to occur (Ostgaard, Roos-Hansson, & Zetherstrom, 1996).

**Balance Issues in Pregnancy**

Uneven weight distribution and stress on the lumbar region leads to postural changes in pregnant women. Ersal and colleagues (2013) found that there are individual differences in postural adaptations for each pregnancy since women solve their postural challenges in their own way. Artal et al (2003) found that the anatomical changes which occur as pregnancy progresses lead to Lumbar Lordosis, which is the leading cause of lower back pain. Lumbar Lordosis also is known to increase during pregnancy. Fifty percent of pregnant women report that they have experienced lower back pain during pregnancy. This pain may cause women to alter their walking patterns, which may, in turn, affect their balance (Gilleard, & Brown, 2002).

These anatomical changes that cause lower back pain and balance issues may increase the risk of falling. This could harm the unborn fetus. In a study of 3900 pregnant women, 26.8% experienced a fall during their pregnancy (Schiff, & Holt, 2008). Twenty four percent of maternal visits to the hospital were because of a fall. Pregnant women are 2.3 times more likely to be hospitalized compared to women who are not pregnant (Weiss, 1999).

There are several other factors that can further exacerbate the risk of falling during pregnancy. Pregnant women have 18% higher ankle stiffness and 25% higher hip stiffness than non-pregnant women. This also may contribute to the lack of balance during pregnancy which can lead to a fall. In addition, an increase in body sway during
the standing phase may be a leading factor for a potential fall (Nagai, Isida, Saitoh, Hirata, Natori, & Wada, 2009). Also, pregnant women who report to work until labor have a higher risk of a fall occurring. Potential risks that may cause pregnant women to fall while they are at work include: slippery floors, moving at a fast/quick pace, and/or carrying an object or a child (Butler, Colon, Druin, & Rose, 2006). Plus, the inherent weight gain of pregnancy leads to a change in the center of mass. Finally, Ersal et al (2013) found that sedentary pregnant women fell more often.

Falls during pregnancy must be taken seriously as they may result in injuries to the mother as well as to the unborn fetus. Pregnant women need to gain their pregnancy weight in a healthy manner and they need to work on their posture and balance in order to prevent a potential fall. Aquatic exercise can help with these goals. First, aquatic exercise can help with the prevention of a fall risk during exercise because it is nearly impossible to fall while in a pool. Second, aquatic exercise may help women to develop healthier postural adaptations as they go through pregnancy. Third, aquatic exercise may lessen low back pain and help with monitoring balance. As a result of all of this, aquatic exercise may be a safe, effective and beneficial form of exercise during pregnancy (Ersal et al., 2013).

**Problem Statement**

The Guidelines of the American College of Obstetrician and Gynecologists (2002) establish for exercise during pregnancy and found that information is provided regarding contraindications, nutritional requirements, and fetal responses for land-based exercise during pregnancy. Vallim, Osis, Cecatti, Aciuk, Silveria and Cavalcante (2011) found that engaging in aquatic exercise during pregnancy reduces stress, reduces blood
pressure, and reduces depression. However, no evidence-based aquatic exercise
guidelines have been developed specific to pregnant women. This project will provide
clear guidelines for aquatic exercise during pregnancy to clinicians, local aquatic
facilities, and pregnant women alike.

Purpose

The purpose of this project was to inform and to introduce exercises and exercise
guidelines which can be performed throughout pregnancy for an aquatic exercise
program and pregnant women. The goal for the manual is to provide exercises, exercise
guidelines, progressions, regressions, and how to do the exercises appropriately. This
manual also provides guidelines and how to incorporate pieces of equipment which
include: aqua bell, aqua fin, aqua paddle, balance board, and ankle/wrist weights. This
aquatic exercise manual will provide information to clinicians, local aquatic facilities,
future research, kinesiology students, and pregnant women.

Clinical Significance

Limited research has been documented with aquatic exercise and pregnancy. The
manual will provide a safe, effective way for pregnant women to exercise throughout
pregnancy. It establishes examples of lesson plans, example of exercises, beginning
motion, and ending motion specific to each exercise.
LITERATURE REVIEW

Land Exercise and Pregnancy

Avery et al (1999) found that exercise guidelines for pregnant women should be created according to the complications inherent in each trimester and should include information about any warning signs. They also found that all exercise programs should exclude the supine position which can obstruct venous return from the uterus which can result in hypotension. Beyond these considerations, land-based exercise programs for pregnant women should meet certain criteria. They should include many repetitive movements. Aerobic exercises should consist of the usage of large muscle groups in a continuous rhythmic manner. Activities such as walking, hiking, aerobic dance, and cycling are appropriate. Resistance training and flexibility exercises are also recommended. For resistance training, women are encouraged to use low weights with multiple repetitions through a dynamic range of motion. This is effective and is safe for both the mother and fetus.

Schoenfeld (2011) created a basic land-based exercise prescription for healthy pregnant women. This exercise prescription is detailed in Table 1 and Table 2 below. Pregnant women who engage in physical activity should follow Table 1 if they are in their 1st and 2nd trimesters of pregnancy. Pregnant women who engage in physical activity should follow Table 2 if they are in their 3rd trimester of pregnancy. Schoenfeld is the only researcher to both break down examples of exercises within each trimester and to create this kind of table of land-based exercises for pregnant women.
Table 1: Examples of Land-Based Exercises (1st and 2nd trimester)

<table>
<thead>
<tr>
<th>Muscular Group</th>
<th>Type of Exercise</th>
<th>Number of Sets</th>
<th>Repetitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td>Lat pull-down</td>
<td>2-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Shoulders</td>
<td>Shoulder press</td>
<td>2-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Chest</td>
<td>Dumbbell chest press</td>
<td>2-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Biceps</td>
<td>Dumbbell Curl</td>
<td>2-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Quadriceps</td>
<td>Lunge</td>
<td>2-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Calves</td>
<td>Toe press</td>
<td>2-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Core</td>
<td>Crunch, plank, side bridge</td>
<td>2-3</td>
<td>10-15</td>
</tr>
</tbody>
</table>

Examples of exercises come from Schoenfeld (2011)
Table 2: Examples of Land-Based Exercises (3<sup>rd</sup> trimester)

<table>
<thead>
<tr>
<th>Muscular Group</th>
<th>Type of Exercise</th>
<th>Number of Sets</th>
<th>Repetitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td>Seated row</td>
<td>1-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Shoulders</td>
<td>Lateral raise</td>
<td>1-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Chest</td>
<td>Seated machine</td>
<td>1-3</td>
<td>10-15</td>
</tr>
<tr>
<td></td>
<td>chest press</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biceps</td>
<td>Dumbbell curl</td>
<td>1-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Triceps</td>
<td>Triceps kickback</td>
<td>1-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Quadriceps</td>
<td>Dumbbell squat</td>
<td>1-3</td>
<td>10-15</td>
</tr>
<tr>
<td>Core</td>
<td>Plank, side bridge</td>
<td>1-3</td>
<td>10-15</td>
</tr>
</tbody>
</table>

Examples of exercises come from Schoenfeld (2011)
Land Exercise vs. Aquatic Exercise and Pregnancy

Aquatic exercise has several advantages over land-based exercise during pregnancy. Land-based exercises occur under the force of gravity. This may cause women to potentially fall and cause harm to the fetus. But, immersion in water up to the chest decreases gravitational pull. In addition, the buoyancy of the water (which creates the ability to float) creates a feeling of physical comfort, improves mobility, and facilitates the use of both the flexor and extensor muscles (Bates, & Hanson, 1998). Woldford (1999) found the usage of these larger muscles helps decrease pain during aquatic exercise. Furthermore, hydrostatic pressure is increased in proportion to the depth of the water. Katz (2003) found that increased hydrostatic pressure causes an increase in venous blood return and decreases the risk of edema. Edema is the swelling caused by fluid that is trapped inside the body’s tissues. It has been found that aquatic exercise reduces leg edema and other physical discomforts associated with pregnancy.

Although Woldford (1999) and Katz et al (1990) determined that aquatic exercise provides many important advantages for pregnant women such as a feeling of comfort, improved mobility, and decreased pain, they did not provide any examples of aquatic exercises. Schoenfeld, on the other hand, created tables of specific exercises for pregnant women but they are all for land-based exercises. Consequently, there is a need for work that provides examples of aquatic exercises for pregnant women.

Aquatic Exercise and Pregnancy

Although there have only been a limited number of studies evaluating the health-related outcomes of aquatic exercise during pregnancy, longitudinal studies have found that aquatic exercise is a safe and beneficial way to be physically active during
pregnancy. Katz et al (1990) suggests that aquatic exercise’s thermal regulation and buoyancy aid in the prevention of joint injuries and that aquatic exercise has no negative effect on the fetus. Aquatic aerobic exercise also reduces edema and arterial pressure, increases the volume of amniotic fluid, controls body weight, lessens back pain, and reduces depression (Kent et. al., 1999; Dertkigil, et. al., 2007; Baciuk, et. al., 2008). The psychological benefits of aquatic exercise during pregnancy include an improved sense of well-being, satisfaction and self-confidence and an increase in body awareness (Hartmann, & Bung, 1999; Bates, & Hanson, 1998).

In other research, Vallim et. al., (2011) conducted a comparative study that was used to find the association between moderate water aerobics and quality of life during pregnancy. Exclusion criteria included: a history of two or more cesarean sections, neurological, pulmonary, musculoskeletal or endocrine abnormalities, a body mass index of less than 30, and any other exclusionary factors identified during the doctor evaluation. In this study, the randomization of two groups included 31 pregnant women who participated in aquatic aerobics and 35 pregnant women who participated in exercise routines provided by their clinic. The women who participated were sedentary, had a low-risk pregnancy and were bearing a single fetus. Quality of life was evaluated with the WHOQOL-BREF questionnaire in the 20th (baseline), 28th, and 36th weeks of pregnancy. The aquatic aerobic group participated in a 50 minute class, three times a week, in an indoor heated pool (28-30 degrees Celsius). The exercises followed guidelines set by the American College of Sports Medicine. A multivariate analysis of variance (MANOVA) was used to compare the questionnaire responses. This analyzed the quality of life scores at three different assessment dates. The results from the assessment showed that 65% of
respondents believed that participating in the aquatic classes would make childbirth easier for them and 25% stated that it was good for their physical well-being. No significant differences were found between the two groups.

A pilot study was conducted by Smith and Michel (2006) to examine the perception of body image, the level of physical discomfort, the mobility and the health-promoting behaviors in a group of pregnant women. Forty women participated in the study. The women were split up into two groups: 20 women in an aquatic exercise group and 20 women in a non-exercise group. The exercise group participated in a 60-minute, three-times-per-week, aquatic exercise program for six weeks. The non-exercise group (control group) was instructed to participate in their normal activities of daily living. The Pregnancy Body Shape Questionnaire (PBSQ) was used to assess each individual’s self-perception of her body image. In addition, the Timed Get Up and Go Test was used to assess mobility. Each participant was asked to get up as fast as she could from a chair with no arms attached to it and then to walk three meters, turn, walk back to the chair, and sit down again. Prior to the study, the participants’ mean weight was obese and they had no history of being active or involved in any exercise program. After the study, the participants in the exercising group showed a significant improvement in mobility, a higher acceptance of body image, a more active lifestyle, and less physical discomfort.

Various researchers discuss advantages that can be gained while pregnant women participate in aquatic exercise. Vallim et al (2011) found that pregnant women participating in aquatic exercise classes reported an overall feeling of well-being and a belief that childbirth would be easier. Smith et al (2006) found results that participants indicated significantly higher mobility and a better acceptance of body image through
aquatic physical activity. Though these two studies list different advantages, both show that aquatic exercise produces positive physical and mental effects in pregnant women.

Borg (1982) also conducted a study in which pregnant women participated in an aquatic exercise program. In this study, a 60 minute aquatic exercise program consisted of a 10 minute warm-up with exercises and stretching, a 25-30 minute movement phase which utilized larger body muscles such as the legs and buttocks, and a 10-15 minute cool down period with abdominal muscle exercises and stretching to promote flexibility. The women were required to monitor their level of exercise intensity using the Perceived Level of Exertion Scale (PLES) during the movement phase. The results of this study showed that the women who participated in the aquatic exercise program reported significantly less physical discomfort, improved mobility, and improved body image compared to a control group. Women who exercise regularly throughout their pregnancy will experience: less weight gain, fewer discomforts, shorter labors, less body image distress, and a speedier postpartum recovery. Many researchers also believe that if women continue to exercise throughout pregnancy they will have less body image distress and fewer discomforts (Vallim et al, 2011, Smith et al, 2006, Borg, 1982).

Although other researchers studied aquatic exercise and the positive physical and mental benefits that it offers pregnant women, Baciuk et. al., (2008) conducted a study to determine the best form of aquatic exercise for pregnant women. In this study, pregnant women who were more than 20 weeks, carrying a single fetus, and who had no gestational risk factors were asked to participate in a study comparing aquatic aerobic exercise to aquatic treadmill exercise. Physical activity performed in the water is safer for pregnant women and it promotes a redistribution of body fluids which leads to an
increase in central blood volume and cardiac output, but the women also must maintain their aquatic exercise program. With this in mind, this intervention consisted of a 50-minute aquatic exercise program in an indoor swimming pool three times a week. One group participated in an aquatic aerobic exercise intervention while the other group walked on an aquatic treadmill. Evaluations were taken during the 18th-20th week of pregnancy, the 22nd-26th week of pregnancy, and the 32nd-36th weeks of pregnancy.

Heart rate, blood pressure, and Vo2 max were measured during the intervention. For the aquatic treadmill group, heart rate significantly increased in the second and third trimesters, Vo2 max increased in the second trimester, and Vo2 max decreased in the last trimester. For the aquatic aerobics group, lower values of heart rate, blood pressure, and Vo2 max remained constant throughout the entire term of pregnancy. In addition, the group that participated in aquatic aerobics appeared to show a more adequate automatic response than the control group (aquatic treadmill group) in the third trimester. Also, the women in the aquatic aerobic program experienced greater enjoyment and had a higher compliance rate with the completion of the study than the women in the aquatic treadmill group.

Dertkigil et. al., (2007) examined sedentary pregnant women with regards to the effectiveness of a moderate aquatic exercise program. Pregnant women that bore a single fetus were asked to participate. The women were randomly placed in an aquatic exercise group or a non-exercise group (no aquatic aerobics). Fifty minute sessions were conducted 3 times a week in a heated pool (30 degrees Celsius). Specific aquatic exercises were not discussed in the article, but the results indicated that a total of 25 pregnant women participated and they all adhered to the study. The women that were in
the aquatic exercise group reported that there was improvement in lower back pain along with a decrease of swelling in the lower limbs. There was not any significant findings or differences among the women who were in the non-aquatic aerobics group.

Like Baciuk et al (2008) who found that the women in the aquatic aerobics class had a higher compliance rate with the completion of the study than the women in the aquatic treadmill group, Dertkigil et al (2007) also found a high compliance rate amongst in the aquatics aerobics program. Both studies determined that women in the aquatic aerobic program experienced greater enjoyment and adherence to their exercise program.

Since Baciuk, Pereira, Cecatti, Braga, and Cavalcante (2008) also show that exercise has been shown to be associated with stress reduction and that physiological stress is associated with the outcome of the fetus, compliance with an exercise program during pregnancy is critical. Physiological stress is defined as the result produced when a structure, system, or organism is acted on by forces that disrupt the equilibrium or produce strain. The pregnant body is naturally at a heightened state of potential stress reactivity and is more vulnerable to being in a state of stress overload (Baciuk et. al., 2008). Therefore, understanding the relationship between stress, pregnancy and exercise is critical.

Lox and Treasure (2000) conducted a study of 41 pregnant women who participated in 45-minute prenatal aquatic exercise classes that were offered twice a week for six weeks. The study measured the participants’ stress levels before and after each exercise session using an instrument called the Subjective Exercise Experiences Scale. The participants reported less psychological distress at the end of the six-week aquatic exercise program as well as at the conclusion of every exercise session. Therefore,
aquatic exercise does reduce stress and it is especially important for the pregnancy population.

Safety Precautions

Being physically active while pregnant is recommended (ACOG, 2002). But, it is important for pregnant women to understand water safety precautions. The American Red Cross Association offers the following pool safety precautions: know how to swim, never swim alone, designate a person to watch the pool at all times, never run in the area outside of the pool, and have appropriate safety equipment in the pool area such as a first aid kit and a water vest. They also advocate that people take CPR courses. In addition, it is important to enter and exit the pool in a slow, controlled manner. Never rush or move in a fast pace while getting in or out of the pool. Accidents such as slipping may occur (American Red Cross Association, 2015).

Staying hydrated is also important for safety for pregnant women. As a pregnancy progresses, blood volume increases. Drinking water ensures that the blood circulates well. Staying hydrated also helps proper nutrients circulate in the blood supply in the endometrium, the tissue that helps the baby grow (pregnancy.org). If you engage in regular exercise during pregnancy, it is even more important to stay hydrated. Carry water on you at all times, and make sure to drink around 8-10 glasses of water per day (Montgomery, 2002). Eating foods such as celery, tomatoes, oranges, and melons also boosts hydration.

Summary of Literature

An abundance of research exists regarding the importance of exercise in general and the importance of exercise during pregnancy. Schoenfeld (2011) describes exercise
examples for a land-based exercise program for each trimester of pregnancy, and the American College of Obstetricians and Gynecologists (2002) discusses the physical differences between each trimester of pregnancy. The American College of Sports Medicine (1995) determined the contraindications, precautions, and exercise guidelines for pregnant women for each trimester for land-based programs. These guidelines have been found for exercise in general, is this the same information for aquatic exercise? Future research should focus on studies specific to aquatics and test the same contraindications and precautions for a land based exercise program for pregnant women. The literature does not go into exercises that decrease lower back pain during pregnancy, this is interesting to me because I feel as a kinesiology student that exercise in the core and abdominal muscles can help reduce lower back pain. Future research should focus on specific exercises that could possibly decrease lower back pain to help women feel more comfortable exercising during their pregnancy. Women are aware that lying in the supinated position is detrimental to the fetus through land exercise, this is found through the exercise guideline for land. While lying in the supinated position, this causes gravity to apply pressure to the vena cava which blocks circulation directly to the fetus and could potentially harm the fetus. No literature shows that lying in the supinated position in aquatics is not detrimental to the fetus. My question is why is this not known? Gravity is diminished in aquatics, which will provide pregnant women a fall free zone for exercise. Future research should perform studies with exercises only in the supinated position and monitor how pregnant women feel after these exercises. This will help women feel more comfortable during their aquatic exercise. Numerous research articles have been found with respect towards pregnancy and falls. Pregnant women are 2.3 times more likely to
be hospitalized due to a fall (Weiss et. al., 1999). However, limited research has been found with how aquatic exercise can reduce the risk of falls throughout pregnancy.

Aquatic exercise does not have gravity and will eliminate the mother in fear of falling during her pregnancy as she exercises. Throughout the literature, though, no research has been found with an aquatic exercise manual or examples of exercises in aquatics for pregnancy. The Aquatic Exercise Manual for Pregnancy will provide clear guidelines for aquatic exercise during pregnancy, and it can be made available to clinicians, local aquatic facilities, and pregnant women alike. Pregnant women also will be able to use this program in the convenience of their own home pools and remain physically active. The manual will also provide specific instructions along with pictures, how to make the exercises easier or harder along with specific pieces of equipment for each exercise.
METHODOLOGY

Instrumentation

Photoshoot for this project began on September 16, 2015 and concluded on September 23, 2015. Prior to beginning photo shoot, pools and equipment needed was obtained. The cool therapy pool at the Center of Achievement was reserved around clinical service times, as to not disturb clients’ therapy schedules. The cool therapy pool was chosen for its consistent lighting, water depth and physical structures for which filming equipment should be attached. Following equipment was used for photo shoot for this manual. The cool therapy pool temperature was set at 31 degree Celsius.

Noodle: Etha Foam Noodle, Swimming Pool Company

Aqua Bell: Travel Weights, Exervo Aqua Fitness Water Dumbbell

Aqua Paddle: Apex Pool Paddle, Pool Exercise Equipment

Aqua Fin: Split Fin, Aquatics Products

Weights: Wrist and Ankle Weights, Speedo Aqua Fitness Combination

Camera: Nikon Red Coolpix L28 20.1MP Digital Camera with 5x Optical Zoom (26395), Nikon

Guidelines for Equipment

Understanding the different types of equipment is important to provide a safe and effective exercise session. The noodle is mainly provided to support you during your exercises. The noodle should be placed underneath the arms so you can lay back on it or you can also sit on top of the noodle for supportive purposes. The aqua bell, aqua paddle, aqua fin, and wrist/ankle weights are manly provided to apply extra resistance for you during your exercises. For pieces of equipment that apply more resistance to strength
exercises make sure you preform the exercise first, make the exercise faster with speed underneath the water, then if these still do not challenge you during your exercise you may use the aqua bell, aqua paddle, aqua fin, and wrist ankle weights to apply greater resistance for that exercise. Pictures of each piece of equipment are listed below so you can visually see what they look like and how to adjust them to your body.
Noodle (Sitting)
Noodle (Laying back)
Aqua Bell
Aqua Paddle
Aqua Fin
Ankle Weight
Wrist Weight
Models

To create this manual, volunteer models were selected to demonstrate the aquatic exercise techniques included in this manual. These models were chosen based upon their higher educational knowledge and their experience with pregnancy. Individuals from the Center of Achievement staff and/or graduate students enrolled in the Adapted Physical Activity program were asked to participate in photo shoots. They were not compensated for their time. All volunteers completed a visual-audio-image release form. They agreed to be photographed, and they agreed to have those photos used in the Aquatic Exercise Manual for Pregnancy. Volunteers spent an hour at a time demonstrating the aquatic exercise techniques. They were asked to demonstrate the techniques properly. Photos of these demonstrations were placed in the manual along with written instructions that describe the techniques. As a result, this detailed instruction will be able to provide safe and effective exercise for readers including clinicians, researchers, and pregnant women.

Procedure of Manual

A Nikon camera was used to take the pictures of the models demonstrating each exercise. After all of the exercises were shot with the camera, each photo was uploaded into a computer and then edited to make them all equal in size. Finally, these edited photos were added to Microsoft Publisher along with corresponding descriptions for each individual exercise.

Aquatic Exercise Manual

Before performing the exercises in the following section, please make sure you know and understand the safety precaution, contraindication, cautions and correct protocol for aquatic exercise. If for any reason you question your ability to carry out the
exercise or lack compete understanding of the information presented in this guide, contact your primary physician for clearance of the movement. If an exercise has a star next to it be aware that this exercise is not possible and should be avoided during the third trimester of pregnancy.
WARM-UP

1. Forward Walking

Figure 1.0

Beginning motion– Stand with feet shoulder width apart (Figure 1.0).

Ending motion– Start walking forward (Figure 1.1).

How to do it– Make sure you keep breathing and complete walking with large steps forward.

Figure 1.1

Variations–

Easier– Forward walk in the deep end of the pool. May use ankle weights for support with walking.

Harder– Forward walk in the shallow end of the pool. Do not need to use any equipment.
WARM-UP

2. Backward Walking

**Beginning motion** – Stand with feet shoulder width apart (Figure 1.2).

**Ending motion** – Start walking backward (Figure 1.3).

**How to do it** – Make sure you keep breathing and complete walking with large steps backward.

**Variations** –

**Easier** – Backward walk in the deep end of the pool. May use ankle weights for support with walking.

**Harder** – Backward walk in the shallow end of the pool. Do not need to use any equipment.
WARM-UP

3. Light Jogging *

Figure 1.4

Beginning motion– Stand with feet shoulder width apart and bring right knee up toward chest (Figure 1.4).

Ending motion– Bring left knee up toward chest while bringing right knee down to starting position (Figure 1.5).

How to do it– Make sure you keep breathing and jog in place.

Figure 1.5

Variations–

Easier– Slow jog in the deep end of the pool. Do not need to use any equipment.

Harder– Moderate pace of jogging in the shallow end of the pool. May use ankle weights.
WARM-UP

4. Side Stepping

Figure 1.6

**Beginning motion**— Stand with feet touching together (Figure 1.6).

**Ending motion**— Open legs and feet so they are shoulder width apart then bring back to beginning motion (Figure 1.7).

**How to do it**— Make sure you keep breathing and side step with large steps.

Figure 1.7

**Variations**—

**Easier**— Side step in the deep end of the pool. Do not need to use any equipment.

**Harder**— Moderate pace of side stepping in the shallow end of the pool. May use ankle weights.
WARM-UP

5. Cross Over Stepping *

Beginning motion—Stand with feet touching together (Figure 1.8).

Ending motion—Open legs and feet so they are shoulder width apart, then cross one leg over the other leg (Figure 1.9 & Figure 2.0).

How to do it—Make sure you keep breathing and cross over step with big steps.

Variations—

Easier—Slowly cross over step in the deep end of the pool. Do not need to use any equipment.

Harder—Quickly cross over step in the shallow end of the pool. May use ankle weights.
WARM-UP

6. Lift Leg

Figure 2.1

Beginning motion- Stand with feet touching together (Figure 2.1).

Ending motion- Lift leg out to the side (Figure 2.2).

How to do it- Does not need to be a big movement. Breath out as leg goes out to side of body.

Figure 2.2

Variations-

Easier- Sideways leg lift in the deep end of the pool. Do not need to use any equipment.

Harder- Moderately pace sideways leg lift in the shallow end of the pool. May use ankle weights.
WARM-UP
7. Pelvic Circles

Figure 2.3

Beginning motion– Stand with feet shoulder width apart (Figure 2.3).

Ending motion– Move hips in a circular motion (Figure 2.4).

How to do it– Feet should stay positioned on the pool floor and not move from the beginning motion. Move hips in a circular motion for 10-15 seconds. Repeat directions.

Figure 2.4

Variations–
There are no variations for this warm-up.
WARM-UP

8. Quad Stretch.

Beginning motion—Stand with feet together (Figure 2.5).

Ending motion—Bring right foot towards buttocks. Hold right foot with right hand. Then repeat on other side (Figure 2.5).

How to do it—Keep breathing during this stretch. If you loose your balance you may hold on to the pool railing. Perform this stretch 8-10 seconds and repeat the other side.

Variations—There are no variations for this warm-up.
WARM-UP

9. Hamstring Stretch *

Beginning motion – Stand with feet shoulder width apart (Figure 2.7).

Ending motion – Extend right leg up and rest it on the pool step. Reach with right arm to right toe and hold the stretch. Then repeat on other side (Figure 2.8).

How to do it – Keep breathing during this stretch. Perform this stretch 8-10 seconds and repeat the other side.

Variations –

Easier – Bring one leg to the deepest step and reach for the toes. If this is too difficult, you may sit down on the shallowest pool step and reach for toes.

Harder – Bring one leg to a mid shallow step and reach for the toes.
WARM-UP

10. Point/Flex Toes

**Beginning motion**—Stand on one foot, raise opposite toe up toward ceiling (Figure 2.9 & Figure 3.1).

**Ending motion**—Stand on one foot, raise opposite foot down to pool floor (Figure 3.0 & Figure 3.2).

**How to do it**—Keep breathing during this stretch. Perform this stretch 8-10 seconds and repeat the other side.

**Variations**—

**Easier**—Perform this exercise holding on to the side of the pool.

**Harder**—Perform this exercise without holding on, this requires more balance.
WARM-UP
10. Point/Flex Toes (Side View)

Figure 3.1

Figure 3.2
WARM-UP
11. Breath and Reach

Figure 3.3

Beginning motion—Stand with feet shoulder width apart. Perform a squat with arms crossed over body (Figure 3.3).

Ending motion—Perform a standing motion with arms reaching as high as you can to the ceiling (Figure 3.4).

How to do it—Inhale deep when you raise arms up. Exhale deep when you bring arms down. Perform this warm-up/cool down two–three times.

Figure 3.4

Variations—
There are no variations for this warm-up.
WARM-UP

12. Head Circles

*Beginning motion*—Stand with feet shoulder width apart. Start with neck tilted toward one shoulder (Figure 3.5).

*Ending motion*—Tilt head up towards ceiling and back down towards other shoulder. Perform head circles. Feet should stay in one place (Figure 3.6 & Figure 3.7).

*How to do it*—Keep breathing during this stretch. Perform this stretch 8-10 seconds and repeat the other side.

*Variations*—There are no variations for this warm-up.
STRENGTH

1. Chest Press

**Beginning motion**— Bend elbows back with hands held like a fist at chest level (Figure 3.8 & Figure 4.0).

**Ending motion**— Arms out straight in front of body. Hands still held like a fist (Figure 3.9 & Figure 4.1).

**How to do it**— Bend elbows and keep arms back, close to sides of chest. At chest push forward until arms are straight. Keep arms under water at all times.

**Variations**-

**Easier**— Perform this exercise above water.

**Harder**— Perform this exercise below water.

You can use aqua fins, aqua gloves, or aqua bells.
STRENGTH

1. Chest Press (Side View)

Figure 4.0

Figure 4.1
STRENGTH

2. Sit on Noodle – Forward Breast Stroke

*Beginning motion* – While sitting on the noodle: at shoulder level keep arms straight out in front of body with palms down (Figure 4.2).

*Ending motion* – While sitting on the noodle: turn hands so palms face outward, then push hands outwardly away from each other (Figure 4.3).

*How to do it* – Perform beginning and ending motions consistently.

*Variations*:

- **Easier** – Sit on step instead of a noodle.
- **Harder** – Breast stroke forward faster. Can use a balance board instead of a noodle.
STRENGTH

3. Sit on Noodle- Backward
   Breast Stroke

Figure 4.4

Beginning motion- While sitting on the noodle extend arms at shoulder level with palms down (Figure 4.4).

Ending motion- While sitting on the noodle, extend arms towards front of body (Figure 4.5).

How to do it- Perform beginning and ending motions repeatedly while consistently moving backward.

Variations-

Easier- Sit on step instead of a noodle.

Harder- Breast stroke backward faster. Can use a balance board instead of a noodle.
STRENGTH

4. Lat Pull Down

Beginning motion- Place hands at sides of each ear, then raise toward the ceiling (Figure 4.6).

Ending motion- Bring hands down towards knees (Figure 4.7).

How to do it- Keep arms close to body. Reach up and pull down.

Variations-

Easier- Above the water in a standing or seated position.

Harder- Under water in the deep end of the pool.

You can use wrist weights, aqua fins, or aqua bells.
STRENGTH

5. Internal/External Rotation

Beginning motion– Make a fist with both hands, hold hands close to stomach with elbows bent (Figure 4.8).

Ending motion– With hands still in fist extend arms out toward side of the body (Figure 4.9).

How to do it– Keep elbows in the same position for the duration of exercise. Movement should not be drastic but very small.

Variations–

Easier– Perform this exercise in the deep end of the pool without additional equipment.

Harder– Perform this exercise in the shallow end of the pool. Can use aqua fins, aqua bells, or wrist weights.
STRENGTH

6. Shoulder Flexion

Beginning motion—Arms relaxed at side of body (Figure 5.0).

Ending motion—Raise arms up towards ceiling while remaining close to ears (Figure 5.1).

How to do it—Arms are relaxed at side of the body. Raise arms up towards the ceiling and back down continuously.

Variations—

Easier—Slightly bend the knees. Push arms up toward ceiling. Do this in shallow end. Do not need to use equipment.

Harder—Slightly bend the knees. Push arms up toward ceiling. Do this in deep end. May use wrist weights, aqua fins, aqua bells, or may lay on back.
STRENGTH

7. Shoulder Extension

**Figure 5.2**

Beginning motion—Extend arms up towards ceiling remaining close to the ears (Figure 5.2).

Ending motion—Arms relaxed at side of body (Figure 5.3).

How to do it—Extend arms up toward ceiling. Lower arms down into the water toward your legs.

**Figure 5.3**

Variations—

Easier—Slightly bend the knees. Perform in shallow end. Extra equipment not necessary.

Harder—Slightly bend the knees. Perform in deep end. May use wrist weights, aqua fins, aqua bells, or may lay on back.
STRENGTH

8. Wall Push-up *

**Beginning motion**—Face a wall in the pool. Place hands on wall shoulder width apart (Figure 5.4).

**Ending motion**—Bring body down towards wall while slightly bending elbows (Figure 5.5).

**How to do it**—Face wall in pool, push your body down towards wall and pull back.

**Variations**—

**Easier**—Smaller incline with body. Feet are closer to the pool wall.

**Harder**—Larger incline with body. Feet are further away from the pool wall.
STRENGTH

9. Pronation

Beginning motion—Arms shoulder width apart in front of body. Keep arms close to body. Palms facing up toward ceiling (Figure 5.6).

Ending motion—Palms facing down toward pool floor (Figure 5.7).

How to do it—Make sure your hands and arms are below water at all times. Keep arms in same position only turning the forearm.

Variations—
Easier—Slow and controlled movement. Do not use equipment.
Harder—Faster movements. May use wrist weights, aqua fins, or aqua bells.
STRENGTH

10. Supination

**Beginning motion**– Arms straight out, shoulder width apart in front of body. Keep arms close to body. Palms facing down towards pool floor (Figure 5.8).

**Ending motion**– Palms facing up toward ceiling (Figure 5.9).

**How to do it**– Make sure your hands and arms are below water at all times. Continuously move palms from beginning motion to ending motion.

**Variations**–

- **Easier** – Slow and controlled movement. Do not use equipment.
- **Harder** – Faster movements. May use wrists weights, aqua fins, or aqua bells.
STRENGTH

11. Wrist Flexion

**Figure 6.0**

**Beginning motion**—Stand with palms facing up, point fingertips towards bottom of pool (Figure 6.0).

**Ending motion**—Bend wrist so hands face chest (Figure 6.1).

**How to do it**—Make sure your hands and arms are below water at all times. Keep arms in same position only turning the wrist.

**Figure 6.1**

**Variations**—

- **Easier**—Slow and controlled movement. Do not use equipment.
- **Harder**—Faster movements. May use wrist weights, aqua fins, or aqua bells.
STRENGTH

12. Wrist Extension

Beginning motion– Bend wrist so fingertips face chest (Figure 6.2).

Ending motion– Bend wrists so palms face up, while fingertips point towards bottom of pool (Figure 6.3).

How to do it- Make sure your hands and arms are below water at all times. Keep arms in same position only turning the wrist.

Variations:

Easier– Slow and controlled movement. Do not use equipment.

Harder– Faster movements. May use wrist weights, aqua fins, or aqua bells.
STRENGTH

13. Bicep curl

Figure 6.4

Beginning motion—Arms extended at sides with fingertips facing towards the bottom of the pool, palms facing up (Figure 6.4).

Ending motion—Bend only at the elbow. Bring hands up toward shoulders (Figure 6.5).

How to do it—Keep arms close to side of your body. Inhale as you bring your arms up to your shoulders. Exhale as you bring your arms down toward your legs.

Figure 6.5

Variations-

Easier—Perform this exercise in the deep end of the pool. You do not need to use any equipment.

Harder—Perform this exercise in the shallow end of the pool. You can use wrist weights, aqua fins, or aqua bells.
STRENGTH

14. Wrist Circles

Figure 6.6

Beginning motion—Right hand moves in a clockwise circular motion. Move left hand in a counter clockwise circular motion only moving the wrist (Figure 6.6).

Ending motion—Same as beginning motion (Figure 6.7 & Figure 6.8).

How to do it—Wrist are the only thing that moves in a continuous motion. Keep below water.

Figure 6.7

Variations—

Easier—No equipment necessary. Slow and controlled movements under water.

Figure 6.8

Harder—You can use wrist weights or aqua fins for equipment. And/or fast and controlled movements under water.

Harder
STRENGTH

15. Push up with Balance Board

Beginning motion– Lay flat on your stomach with head above water. Hold balance board close to chest (Figure 6.9).

Ending motion– Push balance board out towards the bottom of the pool so arms are fully extended (Figure 7.0).

How to do it– Push out with balance board 8-10 repetitions. Breath in as you come back towards chest. Breath out as you push away.

Variations–

Easier– Perform the motion in a slow and controlled pace. 8 reps or less.

Harder– Perform the motion at a faster pace. Can do more than 8 reps.
STRENGTH

16. Shoulder Extension

Figure 7.1

Beginning motion—Keeping elbows straight, lift arms up towards the ceiling, in front of body. Stop at shoulder height (Figure 7.2).

Ending motion—Stand with arms relaxed at sides of body (Figure 7.1).

How to do it—Bring arm down to side of the body 8-10 reps.

Figure 7.2

Variations-

Easier—Perform the motion in a slow and controlled pace.
Do not need to do as many as 8 reps. Do not need to use any equipment.

Harder—Perform the motion at a faster pace. Can do more than 10 reps. May use wrist weights.
STRENGTH

17. Shoulder Flexion

Beginning motion—Stand with arms relaxed at sides of body (Figure 7.1).

Ending motion—Keeping elbows straight, lift arms up towards the ceiling, in front of body. Stop at shoulder height (Figure 7.2).

How to do it—Bring arms up to ceiling 8-10 reps. Arms should be submerged under water.

Variations—

Easier—Perform the motion in a slow and controlled pace. 8 reps or less. No equipment necessary.

Harder—Perform the motion at a faster pace. Can do more than 8 reps. May use wrist weights.
STRENGTH
18. Lunge

**Beginning motion**– Stand with one foot out in front of body. Opposite foot behind body (Figure 7.5).

**Ending motion**– Bring hips straight down. (Figure 7.6).

**How to do it**– When in the lunge position make sure the knee does not exceed over the foot. The heel from the opposite foot is off of the ground at all times. Alternate legs.

**Variations**–

**Easier**– May use ankle weights. Perform exercise in deep end of pool. Keep arms at side of body.

**Harder**– No equipment is necessary. Perform exercise in shallow end of pool. Place hands above body.
STRENGTH
19. Squat

Beginning motion—Stand with feet shoulder width apart. (Figure 7.7).

Ending motion—Squat down while bending knees (Figure 7.8).

How to do it—Feet shoulder width apart. Make sure knees do not exceed your toes when you squat.

Variations—

Easier—Place ankle weights for equipment. Perform exercise in deep end of pool. Keep arms at side of body.

Harder—No equipment is necessary. Perform exercise in shallow end of pool. Place hands above body.
STRENGTH

20. Step up on Box

Beginning motion—Stand directly behind the box (Figure 7.9).

Ending motion—Step up onto the box one leg at a time (Figure 8.0 & Figure 8.1).

How to do it—Place foot on box, followed by opposite foot on box. At the end both feet should be on the box.

Variations—

Easier—Use a box with less height. Perform exercise in deep end of pool. May use ankle weights for equipment. Slow and controlled movements.

Harder—Use a box with more height. Perform exercise in shallow end of pool. Do not need any equipment. Faster pace movements.
STRENGTH
21. Backward Leg Raise

**Beginning motion**—Stand with feet shoulder width apart (Figure 8.2).

**Ending motion**—Extend one leg backwards without bending knee (Figure 8.3).

**How to do it**—Slight bend on the supporting leg. Extend the non-supporting leg backwards for 8-10 reps and repeat on the

**Variations**—

**Easier**—No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

**Harder**—Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH

22. Hip Abduction

Beginning motion – Stand with feet close together but not touching (Figure 8.4).

Ending motion – One leg extends out to the side of your body (Figure 8.5).

How to do it – Keep hips facing forward along with both feet. Keep torso positioned upright. Perform this exercise one leg at a time. One leg 8-10 reps and

Variations–

Easier – No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

Harder – Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH

23. Hip Adduction

**Beginning motion**— One leg extends out to the side of your body (Figure 8.6).

**Ending motion**— Stand with feet close together but not touching (Figure 8.7).

**How to do it**— Keep hips facing forward along with both feet. Keep torso positioned upright. Perform this exercise one leg at a time. One leg 8-10 reps and

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**Variations**—

*Easier*— No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

*Harder*— Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH

24. Leg Circle

Beginning motion-- Start with one leg diagonally behind then move in a clockwise motion (Figure 8.8).

Ending motion-- Stand with feet together but not touching (Figure 8.9 & Figure 9.0).

How to do it-- Complete a circle shape with leg and foot. Complete 8-10 times and repeat opposite leg. May switch directions if desired.

Variations--

Easier-- No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

Harder-- Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH
25. Hamstring Curl

Figure 9.1

Beginning motion– Stand with feet shoulder width apart (Figure 9.1).

Ending motion– Raise one heel towards buttocks only bending at the knee (Figure 9.2).

How to do it– Bring heels towards buttocks for 8-10 reps. Repeat other side.

Figure 9.2

Variations–

Easier– No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

Harder– Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH

26. Hip Flexion *

**Beginning motion** – Stand with feet shoulder width apart (Figure 9.3).

**Ending motion** – Move one knee up towards chest (Figure 9.4).

**How to do it** – Move one knee up towards chest at 90 degrees. 8-10 reps. Repeat other side.

**Variations** –

**Easier** – No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

**Harder** – Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH

27. Hip Rotation

Beginning motion – Stand with feet together (Figure 9.5).

Ending motion – Raise one knee up towards chest, until a 90 degree angle is reached. Then move leg outward while maintaining this position. Bring leg back in front of body and place foot on floor. (Figure 9.6 & Figure 9.7).

How to do it – Bring one knee up towards chest then move entire leg out to side of body. Back in and then back down. 8-10 reps. Repeat other

Variations –

Easier – No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

Harder – Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH

28. Plie Squat

Beginning motion—Feet slightly turned out shoulder width apart (Figure 9.8).

Ending motion—Perform a squat. Bring torso down (Figure 9.9).

How to do it—Start with feet slightly turned out shoulder width apart. Perform the squat with feet pointed out. Make sure knees do not exceed the toes. Be sure not to hold your breath.

Variations:

Easier—No equipment is necessary. Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace.

Harder—Place ankle weights for equipment. Perform exercise in shallow end of pool. Perform exercise at a quick faster pace.
STRENGTH

29. Point Toes

**Beginning motion**—While standing on one leg, bring foot of opposite leg up towards ceiling only moving the ankle (Figure 10.0 & Figure 10.2).

**Ending motion**—Only moving the ankle, point toes downward towards the bottom of the pool (Figure 10.1 & Figure 10.3).

**How to do it**—Hold on to the side of the pool for stability. The standing leg should have a slight bend at the knee. Inhale bringing toes down and exhale bringiing toes up.

**Variations**—

**Easier**—Perform this in a seated position or hold on to the side of the pool deck. Perform exercise at a slow and controlled pace.

**Harder**—Perform this in a standing position. Do not hold on to the pool deck. Perform exercise at a fast quick pace.
STRENGTH

29. Point Toes (Side View)

Figure 10.2

Figure 10.3
STRENGTH

30. Inversion

Beginning motion—Stand with one foot out in front of body while pointing toes down toward bottom of the pool. Keep opposite foot behind body (Figure 10.4).

Ending motion—Turn foot inward, leading with big toes and bring back to beginning motion (Figure 10.5).

How to do it—Rotate foot inward. Repeat this 8-10 reps in a slow and controlled movement.

Variations-

Easier—Perform this in a seated position or holding on to the side of the pool deck. Perform exercise at a slow and controlled pace.

Harder—Perform this in a standing position. Do not hold on to the pool deck. Perform exercise at a fast quick pace.
STRENGTH
31. Eversion

**Beginning motion**—Stand with one foot out in front of body while pointing toes down toward bottom of the pool. Keep opposite foot behind body (Figure 10.6).

**Ending motion**—Turn foot outward leading with small toe and bring back to beginning motion. (Figure 10.7).

**How to do it**—Bring side portion of foot in. Repeat this 8-10 reps.

**Variations**—

**Easier**—Perform this in a seated position or holding on to the side of the pool deck. Perform exercise at a slow and controlled pace.

**Harder**—Perform this in a standing position. Do not hold on to the pool deck. Perform exercise at a fast quick pace.
STRENGTH

32. Single Leg Bicycle with Noodle

Beginning motion—Lean back on noodle with one leg extended forward while bringing the knee of the opposite leg towards the chest. Simulating a bicycle motion (Figure 10.8).

Ending motion—Extend knee from chest (Figure 10.9).

How to do it—Lean back on the noodle for support. Perform a bicycle motion with one leg in a continuous motion. Do this for 8-10 reps. Repeat other side.

Variations:
Easier—Perform exercise in deep end of pool. No equipment necessary. Perform exercise at a slow pace.

Harder—Perform exercise in shallow end of pool. Can use ankle weights. Perform exercise at a faster pace.
STRENGTH

33. Bicycle with Noodle

*Beginning motion*—Lean back on noodle with one leg straight out while opposite knee is in towards the chest (Figure 11.0).

*Ending motion*—Switching straight leg and bent leg by a continuous circular movement (ex. pedaling a bicycle) (Figure 11.1).

*How to do it*—Lean back on noodle or sit on the noodle for stability. Perform with both legs in a continuous motion. A cycle is one rep. Repeat 8-10 reps.

*Variations*—

*Easier*—Perform exercise in deep end of pool. No equipment necessary. Perform exercise at a slow pace.

*Harder*—Perform exercise in shallow end of pool. Can use ankle weights. Perform exercise at a faster pace.
STRENGTH

34. Abdominal Crunch with Noodle *

Figure 11.2

Beginning motion—Lean back on noodle. Legs extended out in front of body (Figure 11.2).

Ending motion—Still leaning back on noodle, bring both knees together toward chest and extend both legs out (Figure 11.3).

How to do it—Bring both knees in for 8-10 reps. Inhale as legs are out, exhale as legs come in toward the chest.

Figure 11.3

Variations—

Easier—Perform exercise at a faster pace. No equipment necessary.

Harder—Perform exercise at a slow and controlled pace. May put ankle weights on.
STRENGTH

35. Abdominal Criss-cross Crunch
with Noodle

Beginning motion– Lean back on
noodle with legs straight
(neutral). Bring left knee in
towards chest while moving right
shoulder towards left knee. Back
to neutral position (Figure 11.4).
Ending motion– Still leaning
back on noodle, move right knee
in towards chest and left
shoulder towards right knee.
Back to neutral position
(Figure 11.5).

How to do it– After completing
both sides is equivalent to one
rep. Perform 8-10 reps on each
side.

Variations:
Easier– Perform exercise at a
faster pace. No equipment
necessary.
Harder– Perform exercise at a
slow and controlled pace. May
put ankle weights on.
STRENGTH

36. Butterfly Legs in/out with Noodle *

Beginning motion—Lay back on noodle, touch bottom of feet together while bending knees (Figure 11.6).

Ending motion—Bring knees together while keeping feet together (Figure 11.7).

How to do it—Move knees towards and away from each other 8-10 repetitions. Body should be in an upright position.

Variations—

Easier—Perform the motion in a slow and controlled pace. May perform less than 8 repetitions.

Harder—Perform the motion at a faster pace. May do more than 8 repetitions.
STRENGTH

37. Side Bend

Beginning motion—Stand with feet shoulder width apart with hands touching body (Figure 11.8).

Ending motion—Slide right hand down towards knee without lifting hand away from your body. Go back to neutral position (Figure 11.9).

How to do it—Repeat this motion on the other side. 8-10 repetitions for both sides. Make sure you look forward and only move trunk down. Keep hips still.

Variations—

Easier—Perform exercise in deep end of pool. No equipment necessary.

Harder—Perform exercise in shallow end of pool. May use wrist weights.
FLEXIBILITY

1. Arm Circles

Beginning motion— Feet shoulder width apart. Start with arms extended slightly out to the side of your body (Figure 12.0).

Ending motion— Make a circle pattern with arms (Figure 12.1 & Figure 12.2).

How to do it— Complete a circle pattern with arms underneath water at all times. Complete 10-15 seconds.

Variations—

Easier— Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace. No equipment is necessary.

Harder— Perform exercise in shallow end of pool. Perform exercise at a quick faster pace. Place wrist weights for equipment.
FLEXIBILITY

2. Reach Across Body

**Beginning motion**—Arms are extended at side of body (Figure 12.3).

**Ending motion**—Bring one arm across chest and hold it with the opposite hand (Figure 12.4).

**How to do it**—Hold each side for 10-15 seconds. Switch sides.

**Variations**—

*Easier*—Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace. No equipment is necessary.

*Harder*—There are no variations to perform this stretch.
FLEXIBILITY

3. Shoulder Shrug

**Beginning motion**—Stand with feet shoulder apart while keeping arms at side of body (Figure 12.5).

**Ending motion**—Raise shoulders up to ceiling of pool (Figure 12.6).

**How to do it**—Move shoulders up and down for a total of 10-15 seconds.

**Variations**—

- **Easier**—Perform exercise in deep end of pool. Perform exercise at a slow and controlled pace. No equipment is necessary.
- **Harder**—There are no variations to perform this stretch.
FLEXIBILITY

4. Hug

Figure 12.7

Beginning motion—Stand shoulder width apart while keeping arms at side of body (Figure 12.7 & Figure 12.9).

Ending motion—Cross arms over chest and hug body (Figure 12.8 & Figure 13.0).

How to do it—Cross arms over chest and hug for a total of 10-15 seconds.

Figure 12.8

Variations—
There are no variations to perform this stretch.

88
FLEXIBILITY

4. Hug (Side View)

Figure 12.9

Figure 13.0
FLEXIBILITY

5. Backwards Shoulder Rolls

**Beginning motion**—Stand with arms at side of body (Figure 13.1).

**Ending motion**—Bring shoulders up towards ceiling, then roll shoulders behind body (Figure 13.2 & Figure 13.3).

**How to do it**—Bring shoulders in a backward circle motion for a total of 10-15 seconds.

**Variations**—There are no variations to perform this stretch.
FLEXIBILITY

6. Triceps Stretch

Figure 13.4

**Beginning motion**– Extend elbows toward ceiling. Place left hand on right elbow (Figure 13.4).

**Ending motion**– Pull down on one elbow and switch sides for one completed stretch (Figure 13.5).

**How to do it**– Make sure you complete both stretches for 10-15 seconds.

Figure 13.5

Variations–
There are no variations to perform this stretch.
FLEXIBILITY

7. Spread Hands

Figure 13.6

**Beginning motion**—Place both hands palms down in front of body. Keep fingers together while keeping hands under water (Figure 13.6).

**Ending motion**—Spread all fingers apart on both hands (Figure 13.7).

**How to do it**—Make sure you complete the stretch for 10-15 seconds.

Figure 13.7

**Variations**—There are no variations to perform this stretch.
FLEXIBILITY

8. Open/Close Hands

Beginning motion—Place both hands in front of body under water and clinch the fists (Figure 13.8).

Ending motion—Open both hands as wide as you can (Figure 13.9).

How to do it—Make sure you complete the stretch for 10-15 seconds.

Variations—There are no variations to perform this stretch.
FLEXIBILITY

9. Wrist Circles

Beginning motion– Arms extended out, form fists under water (Figure 14.0).

Ending motion– Move both fists in a circular motion (Figure 14.1 & Figure 14.2).

How to do it– Make sure you complete for 10-15 seconds.

Variations–

There are no variations to perform this stretch.
FLEXIBILITY

10. Cervical Lateral Flexors

Figure 14.3
Beginning motion – Stand with head facing forward (Figure 14.3).

Ending motion – Move one ear towards one shoulder. Switch sides (Figure 14.4).

How to do it – Make sure you complete both sides of the stretch for 10-15 seconds in a slow and controlled movement.

Figure 14.4

Variations –
There are no variations to perform this stretch.
FLEXIBILITY

11. Cervical Rotators

Beginning motion—Stand with head facing forward (Figure 14.5).

Ending motion—Look over your shoulder. Switch sides (Figure 14.6).

How to do it—Make sure you complete both sides of the stretch for 10-15 seconds in a slow and controlled movement.

Variations—
There are no variations to perform this stretch.
FLEXIBILITY

12. Cervical Extensors

Beginning motion— Stand with head facing forward (Figure 14.7).
Ending motion— Tilt head forward and look towards feet (Figure 15.0).
How to do it— Make sure you complete the stretch for 10-15 seconds in a slow and controlled movement.

Variations—
There are no variations to perform this stretch.
FLEXIBILITY

13. Cervical Flexors

**Beginning motion**—Stand with head facing forward (Figure 14.7).

**Ending motion**—Tilt head backwards and look up at ceiling with mouth closed (Figure 14.8).

**How to do it**—Make sure you complete the stretch for 10-15 seconds in a slow and controlled movement.

**Variations**—There are no variations to perform this stretch.
### Examples of Exercises

**Lesson Plan #1 (Table 3)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Exercise</th>
<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up (5-10 min.)</td>
<td>Figure 1.0-1.1 Forward walking</td>
<td>Big steps, arms swing</td>
<td>Breath</td>
<td>May use ankle weights</td>
</tr>
<tr>
<td></td>
<td>Figure 1.2-1.3 Backward walking</td>
<td>Big steps, arms swing</td>
<td>Breath</td>
<td>May use ankle weights</td>
</tr>
<tr>
<td></td>
<td>Figure 2.3-2.4 Pelvic circles</td>
<td>Feet should not move from floor</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Figure 2.9-3.0 Point/Flex toes</td>
<td>Can hold on to side of the pool</td>
<td>Breath</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Exercise</th>
<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Body (5-10 min.)</td>
<td>Figure 3.8-3.9 Chest Press</td>
<td>Palms at side of chest, palms extend out</td>
<td>Push underwater (harder) Push above water (easier)</td>
<td>Aqua fins, aqua gloves, or aqua balls</td>
</tr>
<tr>
<td></td>
<td>Figure 6.4-6.5 Biopop curl</td>
<td>Palms up and bring toward shoulders</td>
<td>Push underwater (harder) Push above water (easier)</td>
<td>Aqua fins, aqua gloves, or aqua balls</td>
</tr>
<tr>
<td></td>
<td>Figure 4.4-4.5 Backward breast stroke on noodle</td>
<td>Palms out at sides of body, then bring towards center</td>
<td>Push underwater (harder) Push above water (easier)</td>
<td>Noodle</td>
</tr>
<tr>
<td></td>
<td>Figure 6.0-6.1 Wrist flexion</td>
<td>Bring fingertips toward body</td>
<td>Do not move wrists</td>
<td>None</td>
</tr>
</tbody>
</table>
### Examples of Exercises

<table>
<thead>
<tr>
<th>Component</th>
<th>Exercise</th>
<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Body</td>
<td>Figure 11.2-11.3 Abdominal Crunch with Noodle</td>
<td>Bring both feet in at same time</td>
<td>Breath</td>
<td>Noodle</td>
</tr>
<tr>
<td>(5-10 min.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 7.5-7.6 Lunge</td>
<td>Arms along side of the body</td>
<td>Knees to not exceed toes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 9.1-9.2 Hamstring Curl</td>
<td>Bring heels up towards buttocks</td>
<td>Feet shoulder width apart</td>
<td>May use ankle weights</td>
</tr>
<tr>
<td></td>
<td>Figure 8.6-8.7 Hip Adduction</td>
<td>Leg extend out to side and bring towards midline</td>
<td>Hips and feet facing forward</td>
<td>May use ankle weights</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Exercise</th>
<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool Down</td>
<td>Figure 3.5-3.7 Head Circles</td>
<td>Slow and controlled movement</td>
<td>Breath</td>
<td>None</td>
</tr>
<tr>
<td>(5-10 min.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 12.5-12.6 Shoulder shrugs</td>
<td>Move shoulders up and then down</td>
<td>Breath</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Figure 13.6-13.7 Spread hands</td>
<td>Fists in a ball and then expand out</td>
<td>Breath</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Figure 12.0-12.2 Arm circles</td>
<td>Move arms in a circular pattern</td>
<td>Breath</td>
<td>None</td>
</tr>
</tbody>
</table>
## Examples of Exercises

Lesson Plan #2 (Table 4)

<table>
<thead>
<tr>
<th>Component</th>
<th>Exercise</th>
<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>Figure 1.6-1.7</td>
<td>Feet together, feet apart</td>
<td>Big steps and breath</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Side stepping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 1.4-1.5</td>
<td>One knee up to chest and repeat</td>
<td>Slow movement and breath</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Light jogging</td>
<td>opposite side</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 3.3-3.4</td>
<td>Small squat, bring arms up and</td>
<td>Feet shoulder with apart and</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Breath and reach</td>
<td>into a good stretch</td>
<td>deep breathing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 3.5-3.7</td>
<td>Arms down and feet shoulder</td>
<td>Slow and controlled</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Head circles</td>
<td>width apart</td>
<td>movement</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Exercise</th>
<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Body</td>
<td>Figure 4.6-4.7</td>
<td>Arms up towards ceiling and bring</td>
<td>Breath</td>
<td>Wrist weights,</td>
</tr>
<tr>
<td>(5-10 min.)</td>
<td>Lat-pull down</td>
<td>down towards toes</td>
<td></td>
<td>aqua fins, or aqua bells</td>
</tr>
<tr>
<td></td>
<td>Figure 5.4-5.5</td>
<td>Feet touching and arms on wall</td>
<td>Body slightly bent</td>
<td>Wall of pool</td>
</tr>
<tr>
<td></td>
<td>Wall push-ups</td>
<td>shoulder width apart</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 4.8-4.9</td>
<td>Make fist and bring fist towards</td>
<td>Do not move shoulders</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Internal rotation</td>
<td>midline</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure 4.2-4.3</td>
<td>Palms toward center of body, then</td>
<td>Push underwater (harder) push</td>
<td>Noodle</td>
</tr>
<tr>
<td></td>
<td>Forward breast stroke on</td>
<td>bring out towards side of body</td>
<td>above water (easier)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>noodle</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Examples of Exercises

<table>
<thead>
<tr>
<th>Component</th>
<th>Exercise</th>
<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Body (5-10 min.)</td>
<td>Figure 11.4-11.5 Abdominal Crisscross Crunch with Noodle</td>
<td>Bring opposite leg toward chest, opposite shoulder to knee</td>
<td>Slower pace is easier, faster pace is harder</td>
<td>Noodle</td>
</tr>
<tr>
<td></td>
<td>Figure 7.9-8.1 Step up on box</td>
<td>Feet in-front of box, on-top of box, and over</td>
<td>Feet shoulder width apart</td>
<td>Box</td>
</tr>
<tr>
<td></td>
<td>Figure 8.8-9.0 Leg Circles</td>
<td>Rotate leg in a circular pattern</td>
<td>Slower pace is easier, faster pace is harder</td>
<td>May use ankle weights</td>
</tr>
<tr>
<td></td>
<td>Figure 9.8-9.9 Plie Squat</td>
<td>Feet rotated out and perform a squat</td>
<td>Knees should not exceed toes</td>
<td>May use ankle weights</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
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<th>Arms/Feet</th>
<th>Cues/Tips</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool-Down (5-10 min.)</td>
<td>Figure 12.7-13.0 Hug</td>
<td>Arms down at side, then hug body</td>
<td>Breath</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Figure 6.6-6.8 Wrist circle</td>
<td>Circle wrists under water</td>
<td>Breath</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Figure 13.4-13.5 Triceps stretch</td>
<td>Place hand on elbow and pull back over head</td>
<td>Breath</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Figure 14.5-14.6 Cervical rotators</td>
<td>Look right to left</td>
<td>Breath</td>
<td>None</td>
</tr>
</tbody>
</table>
DISCUSSION

The aquatic exercise manual for pregnancy is the first and only manual for pregnant women to exercise in an aquatic environment. It establishes safe, effective, examples of lesson plan, example of exercises, beginning motion, ending motion specific to each exercise, exercises that should not be performed after the second trimester of pregnancy, progressions, and regressions. This manual also provides guidelines and how to incorporate pieces of equipment during the aquatic exercises which include: aqua bell, aqua fin, aqua paddle, balance board, and ankle/wrist weights.

American College of Sports Medicine (1995) guidelines introduce exercise guidelines and how following these guidelines are important with continuing physical activity. Understanding the guidelines for exercise will help you engage in physical activity throughout a lifetime.

The limitations include the manual provides exercises for healthy pregnant women, women who are not fearful of the water, ensure the women are performing the exercises appropriately, establish progressions and regression specific for each woman. Delimitations include that this is an exercise protocol for pregnant women only. The second delimitation was that a pregnant woman must be safe and comfortable in the water. A final delimitation was that the women must be without pregnancy complications. Assumptions may also include that an aquatic exercise manual provides an evidence-based aquatic exercise prescription for pregnant women. The second assumption was that each woman can read and interpret the aquatic exercise manual.

It is recommended that future studies provide a more extent with each category of exercises, (warm-up exercises, strength exercises, and flexibility exercises) research on the effects of the manual, perhaps DVD instruction, and qualitative research with either
survey’s or interview’s from each woman who utilizes the manual. I propose the imitation of a research study to examine the effects of implementing this instructional manual for pregnant women. A research study could validate that the implementation of this project was beneficial to improve engagement in physical activity among pregnant women throughout their pregnancy.

It is also recommended that future research should also focus on decreasing lower back pain and pregnancy. Limited research is found with exercises that decrease lower back pain during pregnancy, this is interesting to me because I feel as a kinesiology student that exercise in the core and abdominal muscles can help reduce lower back pain. As the exercise guidelines state (ACSM, 1995), pregnant women are aware that lying in the supinated position is detrimental to the fetus through land-based exercise. While lying in the supinated position, this causes gravity to apply pressure to the vena cava which blocks circulation directly to the fetus and could potentially harm the fetus, this has been shown with research in land. No literature has shown that lying in the supinated position in aquatics is not detrimental to the fetus. With respect to aquatic exercise, gravity is limited which will provide pregnant women a safe free zone for the fetus during aquatic exercise. Future research should perform exercises in the supinated position and monitor how pregnant women along with the fetus feel after each of the exercises. Monitoring of the exercises can be done through the rate of perceived exertion scale. This would monitor how they feel after each exercise, this scale is from 6-20. Six meaning the intensity of the exercise is not vigorous and heart rate is not elevated. A twenty meaning the intensity of the exercise is extremely vigorous and heart rate is elevated. A limitation could potentially be each women may perceive their own feelings differently compared
to another woman. Each individual perceives this in a different manner, perhaps
monitoring heart rate or blood pressure will be more accurate. Heart rate or blood
pressure can have its own scale, when a woman goes above or below the scale that would
determine whether the supinated position is harmful to the mother or the fetus. Having
extensive knowledge on this matter will provide clinicians and researchers the
opportunity to enhance supinated exercises on land as well as aquatics. With all of these
physiological changes occurring throughout the body such as, an increase in weight gain,
and a change in the center of gravity, it is still important to exercise throughout
pregnancy. As weight and center of gravity progresses, pregnant women may experience
a waddle gait. This waddle gait is a mediolateral shift in the center of gravity. A potential
fall could occur, pregnant women are 2.3 times more likely to be hospitalized due to a fall
(Weiss et al., 1999). Therefore, the benefits of an aquatic exercise manual provides a fun,
safe and effective way to stay physically active during pregnancy. It produces many
positive physical and mental benefits, it is fun, enjoyable, it is not detrimental to the
health of the mother or of the fetus, it provides pregnant women to exercise in the
supinated position, reduce the risks of falls, decrease lower back pain, and staying active
through aquatic exercise.
References


W.B. Saunders


Vallim A. L., Osis, M. J., Cecatti, J. C., Baciuk, E. P., Silveria, C., Cavalcante, S. R.,


Appendix A
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Appendix C

Visual/Audio Image Release Form

I grant permission to California State University, its employees and agents, to take and use visual/audio images of me. Visual/audio images are any type of recording, including photographs, digital images, drawings, renderings, voices, sounds, video recordings, audio clips or accompanying written descriptions. CSU will not materially alter the original images. I agree that CSU owns the images and all rights related to them. The images may be used in any manner or media without notifying me, such as university-sponsored web sites, publications, promotions, broadcasts, advertisements, posters and theater slides, as well as for non-university uses. I waive any right to inspect or approve the finished images or any printed or electronic matter that may be used with them.

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I am at least 18 years of age and competent to sign this release. I have read this release before signing, I understand its contents, and I freely accept the terms.

Printed Name_________________________Date_________________________

Signature_________________________Telephone or email address_________________________

Parent or Guardian if under 18 years of age_________________________Address (optional)_________________________

Project name:_________________________
Photographer name/signature/contact information/notes._________________________