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THE EFFECTS OF AN AQUATIC INTERVENTION PROGRAM ON THE DISCOMFORTS OF PREGNANCY

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

by

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In memoriam:

James A. O'Hanlon

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Abstract

THE EFFECTS OF AN AQUATIC INTERVENTION PROGRAM ON THE DISCOMFORTS OF PREGNANCY

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Approximately 50% to 80% of pregnant women complain of low back pain, edema, and other discomforts. Although exercise programs have been recommended to decrease the discomforts of pregnancy and improve body image. There is a paucity of research in this area. There is very little research on exercise in water, despite theoretical and empirical advantages of such activity.

This study's aims were to determine the impact of an aquatic exercise intervention program on pregnant women's body image, self-efficacy, perception of barriers to health-promoting behaviors, health-promoting behaviors, mobility, and discomforts. Pender's Health Promotion Model (1996) served as the framework for the study. A two group quasi-experimental, pretest/post-test design was used. A convenience sample of 40 pregnant women who were at least 19 weeks gestation without medical complications as

defined by the American College of Obstetricians and Gynecologists comprised the sample. The experimental group (n = 20) participated in a six-week aquatic exercise program involving three 60-minute sessions per week. The exercises were designed to strengthen the pregnant woman's abdominal muscles and flexibility. The control group received no intervention

Data were analyzed using analysis of covariance. The discomfort and mobility pretest scores were entered into the ANCOVA equation as covariates on all hypothesis tests.

The participants in the exercise intervention group had a statistically significant improved level of body image ($F = 3.44$, $p = 0.05$, increased participation in health promoting behaviors ($F = 3.58$, $p = 0.05$), less discomfort ($F = 33.07$, $p = <0.001$), and improved mobility ($F = 40.61$, $p = <0.001$) than pregnant women who do not participate in the aquatic exercise. There was no statistically significant difference between the groups in the areas of perceived self-efficacy and barriers to health promoting behaviors.

CHAPTER 1

Introduction

The childbirth year, from conception through the perinatal/postpartal transition, places a woman's body in a continual physiological and psychological adaptive state. Although pregnancy is considered a normal physiological function necessary for procreation, many women express concern about the common discomforts they encounter during pregnancy. Low back pain (Davis, 1996), edema (Katz, McMurray, Goodwin & Cefalo, 1990), and leg cramps are the more prevalent discomforts reported by essentially healthy pregnant women (Horns, Ratcliffe, Leggett, & Swanson, 1996; Koniak-Griffin, 1994). Approximately 50% to 80% of pregnant women complain of low back pain, edema, and other discomforts (Noble 1995; Ostgaard, Zetherman, Roos-Hansson, & Svanberg, 1994).

The traditional interventions for pregnancy-related back pain have involved a maternity support girdle, body mechanics techniques taught in Lamaze childbirth preparation courses at about 30 weeks gestation, or bed rest. Such interventions are typically prescribed after back pain impedes the pregnant woman's ability to function (Cunningham, 1993). Edema has been traditionally treated with support hose, dietary restrictions in sodium intake and fluid restriction, and /or bed rest. Both low back pain and edema problems force women to adopt a more sedentary lifestyle.

Psychologically, pregnancy challenges a woman's experience of her body by altering her contours and body boundaries. Her visual image changes as the breasts enlarge by two to three pounds, the waist disappears, the ribs flare as the uterus rises, and the hips widen as the pelvis spreads. Her posture shows rounded shoulders, a swayed back and swollen feet, and her walk becomes a waddle (Low, 1993; Richardson, 1990). Fifty percent of pregnant women report a negative body image during and after pregnancy (Fawcett, 1989; Hofmeyer, Marcos, & Butchart, 1990; Walker, 1998).

Body image concerns have traditionally been addressed by limiting the amount of weight a pregnant woman should gain (Cunningham, 1997). But calorie restricted diets and the fear of being criticized by her physician or even hospitalized for excessive weight gain, may encourage poor eating behaviors. It is not unusual that pregnant women binge after a doctor's visit, or even worse, initiate starvation dieting as the next scheduled visit time grows near (Brumberg, 1997; Cunningham, 1993). Exercise to maintain non-pregnant activity level and metabolic status perhaps result in health promotion.

Health promotion is the primary strategy for improving the health status of pregnant women. In this context, health is defined as a resource for everyday living and health promotion is considered the process of empowering people to increase control over and to improve their health. Women are inclined to take better care of themselves during pregnancy (Low, 1993). They tend to seek prenatal care to insure a safe passage through pregnancy, labor, and delivery (Rubin, 1976). Because of their concerns about the pregnancy and birth outcome, pregnant women are more likely to be receptive to participation in health-promoting practices (Telleen, 1993). Based on the results of a pilot

study, pregnant women who participated in an aquatic exercise program had a more positive attitude toward physical activity and health responsibility behaviors (Smith, 1998).

Pregnancy may lead to problems with performing activities of daily living. The physiological changes of pregnancy may challenge the pregnant woman's endurance and mobility levels. Although there are no specific studies on mobility problems of pregnant women, the exercise literature alludes to the problem. Horns et al. (1996) studied primiparas who were sedentary and compared them to those who were physically active. They found that pregnant women who were sedentary reported more fatigue, shortness of breath, leg cramps and edema problems. The active pregnant women had fewer overall pregnancy related discomforts. However, Clapp (1998) reported that women who exercised before and during the early half of their pregnancy tended to stop exercising because of mobility problems.

Exercise, as an intervention to decrease physiological and psychological pregnancy discomforts, is not a new notion (Clapp, 1998; Horns et al., 1996; Koniak-Griffin, 1994). From biblical to modern times, pregnant women have been encouraged to stay active to enhance maternal and fetal well-being. However, the primary focus of the literature and research investigations on this topic have involved land-based exercise (Artal & Gardin, 1991).

In 1985, the American College of Obstetricians and Gynecologists (ACOG) released the first safety guidelines on exercise during pregnancy. One of ACOG's (1994) recommendations was non-impact exercise, such as cycling and swimming. The ACOG

guidelines were developed as safety standards to prevent maternal and fetal injury related to maternal exercise. However, over the past century, sea bathing has been consistently recommended as the best exercise for pregnant women (Artal & Gardin, 1991; Martin, 1992; Noble, 1995; Williams, 1903).

Purpose of the Study

While there is research to support the safety and efficacy of exercise during pregnancy, there is a lack of research data on the effects of aquatic exercise. The dearth of research about aquatic exercise during pregnancy is the catalyst for this study. This study aimed to determine the impact of an aquatic exercise intervention program on pregnant women's body image, health-promoting behaviors during pregnancy, mobility, and discomforts.

A two-group, quasi-experimental pretest/post-test design was selected for the study. There was a six-week interval between pretest and post-test. The sample consisted of pregnant women who were at least 19 weeks gestation without medical complications as defined by the American College of Obstetricians and Gynecologists (ACOG, 1994).

Hypotheses

Six hypotheses were tested. The hypotheses were:

H_1: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have an improved level of body image as compared to pregnant women who do not participate in the aquatic exercise program as measured by the Pregnant Body Shape Questionnaire (PBSQ).

H_2: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have an higher level of self-efficacy than pregnant women who do not participate in the aquatic exercise program as measured by the Perceived Health Competence Scale (PHCS).

H_3: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a lower level of barriers to health promoting behaviors than pregnant women who do not participate in the aquatic exercise program as measured by Barriers to Health Promoting Behaviors Scale (BHPBS).

H_4: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have improved health promoting behaviors as compared to the pregnant women who do not participate in the aquatic exercise program as measured by the Health-Promoting Lifestyle Profile (HPLP).

H_5: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have less discomfort than pregnant woman who do not participate in the aquatic exercise program as measured by the Smith's Pregnancy Discomfort Intensity Index.

H_6: Following completion of a six-week aquatic exercise program, pregnant women participating in an aquatic exercise program will have improved their

mobility level more than pregnant women who do not participate in the aquatic exercise program as measured by the Timed Get Up and Go Test.

Definition of Terms

The following definitions for concepts and variables will be used throughout the study:

Prenatal aquatic exercise is a 60 minute exercise class, meeting three times per week for 6 weeks, designed to promote flexibility and strengthen abdominal muscles weakened during pregnancy. The exercise program is conducted in a 4 to 5 foot deep swimming pool.

Body image refers to the psychological experience and beliefs that individuals have about their bodies as measured by the Pregnancy Body Shape Questionnaire.

Back pain is a distressing sensation in the lower lumbar region.

Edema is an accumulation of fluid in the tissue spaces, usually present in the lower extremities, causing a distressing sensation of tightness or pain.

Leg cramps are painful contractions or spasms of the leg muscles.

Mobility is the ability to move freely within one's environment.

Study Rationale

Pregnant women have experienced social pressures to maintain acceptable appearances for centuries, but now these pressures have become more intense because pregnant woman have become more visible outside of the home environment. Pregnancy complicates a woman's body image as she is faced with new and conflicting social perceptions and physical challenges. Over 50% of pregnant women report dissatisfaction

with their body image (Hofmeyer et al., 1990; Walker, 1998). The aquatic principle of buoyancy is an upward "push" that acts opposite gravity, which holds a body down. If a pregnant woman stands in chest-deep water she will feel 75% lighter. For example, if she weighs 200 pounds she will feel like she weighs 50 pounds. This transitory state of weight loss elevates the sense of body image and well-being (Noble, 1995). In addition, aquatic exercise increases a person's endorphin level which in turn, increases a person's sense of well-being.

Olympic gold medal winning gymnast Mary Lou Retton described pregnancy as the most physically and psychologically challenging phase in her life. She considered herself a healthy person who had a "normal pregnancy" (1998). Before her pregnancy, she had laughed at cartoons presenting unkempt, swollen, slouching, surly, and complaining pregnant woman. Now, she and many others express concern that no one prepares or listens to women who are experiencing "the minor discomforts of pregnancy" (Becker, Stuifbergen, & Sands, 1991). McMurray (1998) noted that pregnant women who participated in an aquatic exercise program reported a decrease in the maternal discomforts of back pain and leg cramps, but he did not measure these outcomes.

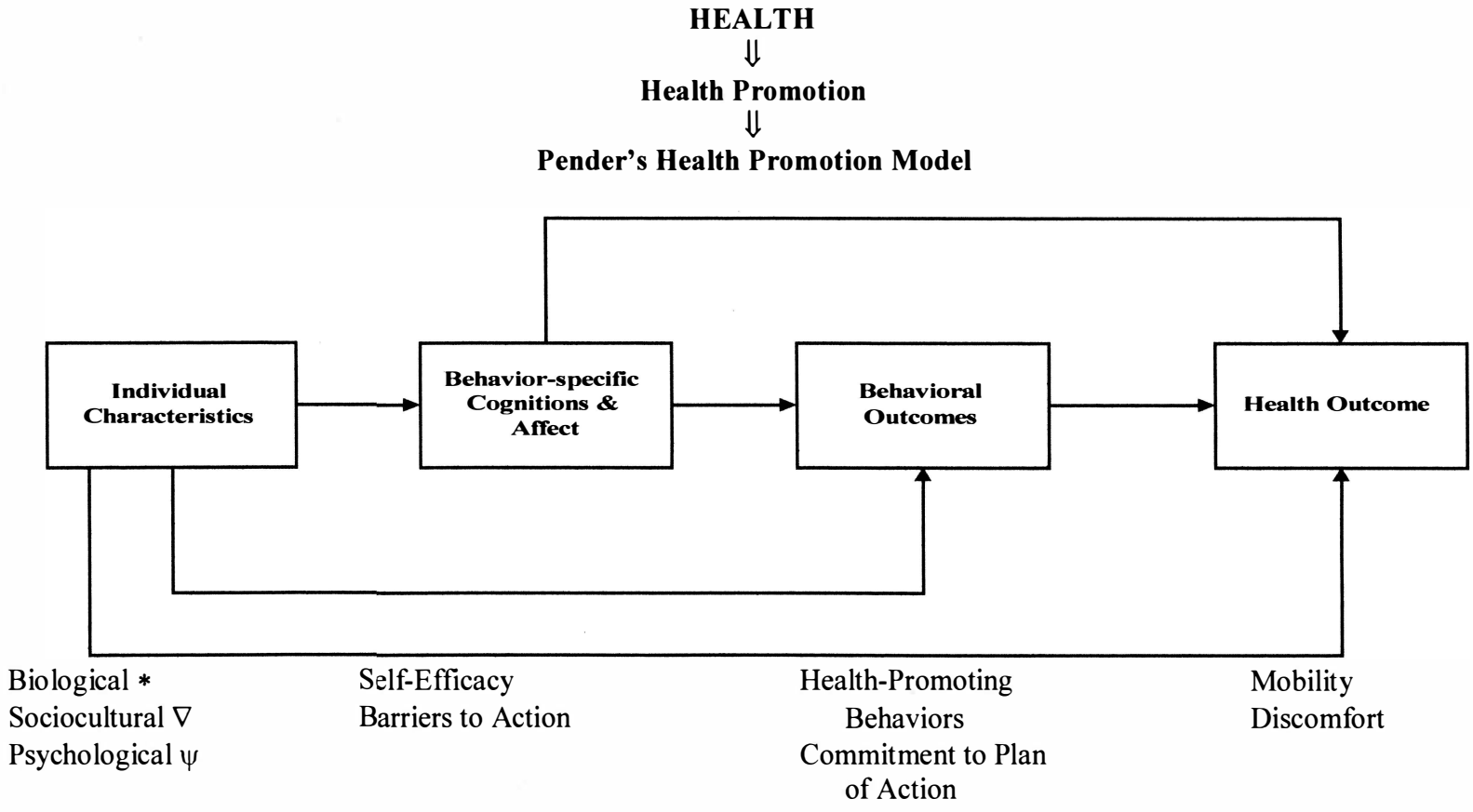
The decrease in a pregnant woman's mobility impedes her ability to maintain her functional status. In addition, pregnant women who participate in land- based exercise tend to stop or decrease the frequency of exercise after twenty weeks gestation because of mobility related problems (Clapp, 1998). Mobility related problems include changes in the center of gravity that increase the likelihood of falling and edema of the lower

extremities impedes walking. These mobility problems invite a sedentary lifestyle, which may further increase the level of maternal discomfort.

Conceptual Theoretical Empirical Framework

The conceptual-theoretical-empirical framework (Fawcett & Downs, 1992) for this study, which is illustrated in Figure 1, was an expanded version of Pender's Health Promotion Model (Pender, 1996). In this section, the construct of health and the concept of health promotion, which are fundamental to Pender's model, will be reviewed. Furthermore, the theoretical concepts of Pender's model appropriate to the study will be explored. These concepts were: individual characteristics, behavior specific cognitions and affect, behavioral outcome and commitment to a plan of action, and health outcomes. Pender's Health Promotion Model has been used as a conceptual framework in three previous studies relating to pregnancy (Kemp & Hatmaker, 1992; Serafine & Broom, 1998; Teleen, 1993).

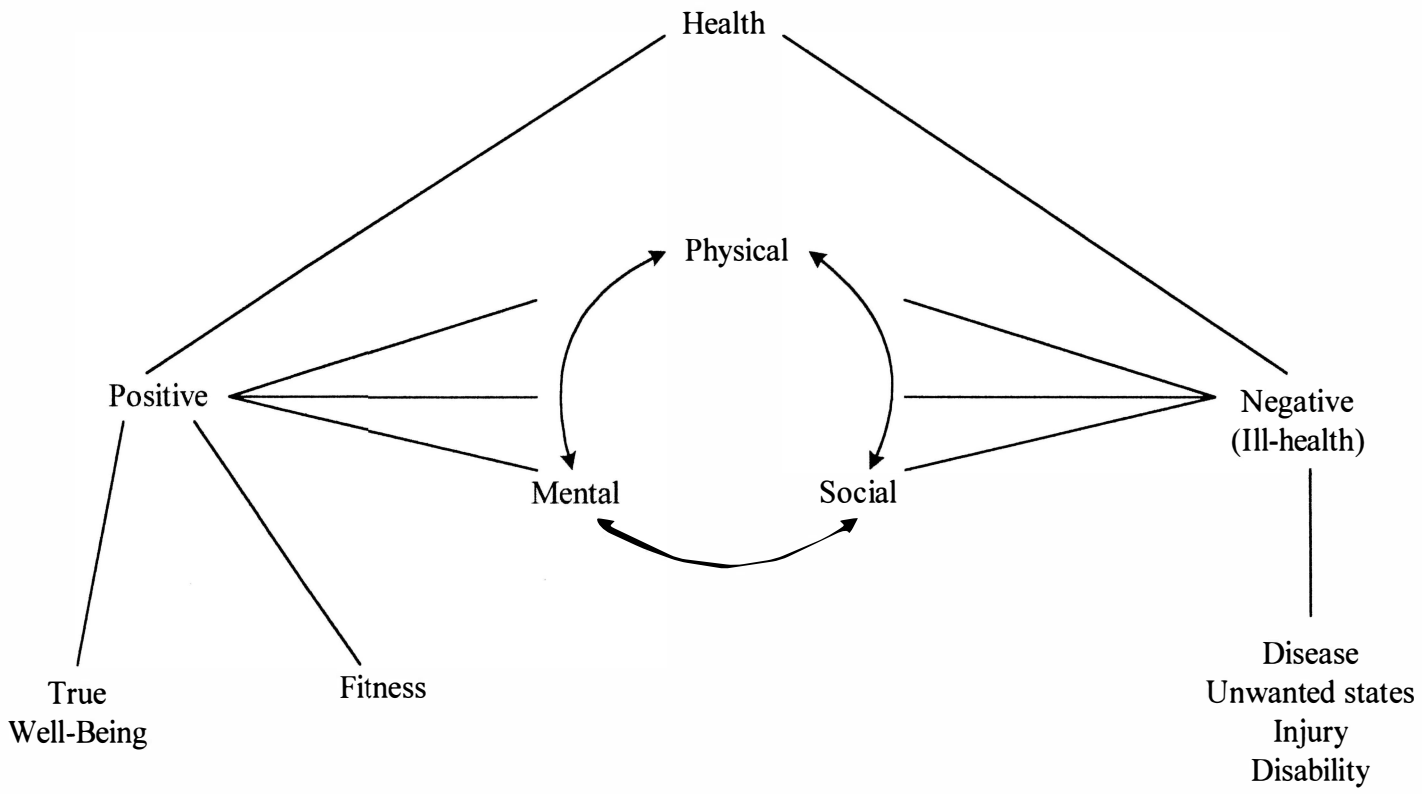
Figure 1. Conceptual Theoretical Empirical Framework



Construct of Health

The construct of health has a long history, dating back some 900 years. Under the umbrella term of health lies a spectrum of meanings, ranging from a focus on disease and the absence of disease, to a focus on the prevention of disease and the promotion of lifestyle changes to improve and maintain health and wellness levels (Arnold & Breen, 1998; Pender, 1996). The term health is derived from the Old English "hoelth," which meant being safe and of whole body (Webster, 2000). In the twelfth century, this term evolved to the Middle English "haelth"(Webster, 2000) which meant being free of disease or healed (Downie ,Tannahill, & Tannahill, 1996; Pender, 1996). In 1946, the World Health Organization (WHO) described health as one's subjective state of complete physical, mental and social well-being. In doing so, the WHO formulated a definition of health that was positive and thus far different from those definitions focusing on the negative aspects of health, such as the absence of disease and infirmity. More recently, Downie et al. (1996) developed a model of health, shown in Figure 2, which expanded the World Health Organization's definition of health to include fitness as a second dimension determining one's health. In other words, according to Downie and colleagues, the positive aspects of health are "true well-being" and fitness, whereby levels of fitness range from the ability to carry out the activities of daily life without undue distress, to the pursuit of competitive performance.

Figure 2. Concept of Health



Concept of Health Promotion

The concept of health promotion has been fundamental to nursing since the time of Florence Nightingale. In her Notes on Nursing (1860), Nightingale addressed the need for a clean environment, a balanced diet and smoke-free air, as well as physical vigor as a crucial factor in regaining one's health after disease. More than a century later, the U.S. Surgeon General published the 1979 document "Healthy People" to promote the wellness of the American population (Healthy People, 1979). The national goals set forth in this document suggested that health care shift its focus from the treatment of disease to health promotion. In doing so, health care would take a proactive approach to wellness. In 1992, the U.S. Department of Health and Human Services released its "Healthy People 2000: National Health Promotion and Disease Prevention Objectives" that were aimed at improving our nation's health status by the year 2000 (U. S. Department of Health and Human Services, 1992). It emphasized the role of individuals as active agents in shaping their own health practices to optimize their wellness. Two of the areas targeted for improvement were maternal health and physical fitness. Smith (1983) defined health promotion as the fostering awareness, influencing attitudes and identifying lifestyle alternatives so that individuals can make informed choices and change behaviors to achieve optimal levels of physical and mental health. For Pender (1987, 1996), health-promoting behaviors are activities directed toward sustaining or improving one's level of well-being.

The year 2000 has passed and the United States' report card on achievement, anticipated through its "Healthy People 2000" objectives, indicates a lack of progress

towards meeting some of these objectives as well as the deterioration of health status in some citizens. The cost of this failure is a higher rate of no leisure-time physical activity and higher health care costs. The incline toward a more sedentary lifestyle constitutes a public health burden that is more than a monetary cost. Other ramifications of inactivity include deteriorating mental functions as well as declining feelings of self-efficacy and emotional well-being (Manson & Van Itallie, 1996, Powell & Blair, 1994). These costs are even higher with regards to minority populations.

There is increasing concern regarding the relationship between socio-economic status (SES) and ethnicity in regards to level of physical activity. In ancient times, the aristocrat was pictured as sedentary and plump, while the servant/working class was muscular and lean. In the 1998 Physical Fitness and Activity Report, concern was expressed about the growing amount of no leisure-time physical activity level among the African American and Hispanic populations (U. S. Department of Health and Human Services, 1998). This problem led to the development of "1998 Physical Fitness and Activity Report " objectives to follow-up with the development of culturally appropriate health models for enhancing physical activity and fitness in these populations.

Historically, women were not encouraged to give their all physically, in part because sweat was seen as unfeminine. In the nineteenth and twentieth centuries, strides were made to increase women's participation in formal education and to reduce the intensity of labor related to household work. As a result, more women joined the workforce and were less likely to be viewed as frail and infirm. At the close of the

twentieth century, the life expectancy of women was predicted to be 78.6 years (Wiest & Lyle, 1997).

Inspiring individuals to change their lifestyles and behaviors requires the use of motivational strategies. Thus, the foundation of health promotion is rooted in two major motivational theories: social cognitive theory and expectancy-value theory (Becker, 1993). Social cognitive theory is an interactional and conditioning theory of causation of behavior change based on modeling and self-efficacy (Bandura, 1993, Pender, 1996). Bandura (1993) indicated that learning entails cognitive and social processes. Human beings acquire knowledge through the cognitive processing of information and through the modeling of other people's behavior (Stajkovic & Luthans, 1998). According to Bandura, self-efficacy reflects a person's perceived capability to accomplish a task or goal. In short, the outcome of behavior reinforces the continuance of a practice. According to Bandura (1995), the higher a perceived self-efficacy, the more likely a person will continue a health promoting behavior. Individuals perform a twofold evaluation of a proposed behavior: 1) Did it produce a desired effect? 2) How confident are they in performing the behavior to achieve the desired outcome?

As a major contributor to the development of behavior theory, Lewin (1935) described the term "expectancy value" as the probability that a behavior will produce a desired outcome. According to Lewin, expectancy denotes the belief in one's ability to succeed. Thus, someone with a history of success in similar situations is likely to expect or anticipate success in subsequent, similar situations. Value, then, is the belief that the performance of a chosen task will bring about certain benefits (Gorin, 1998). One method

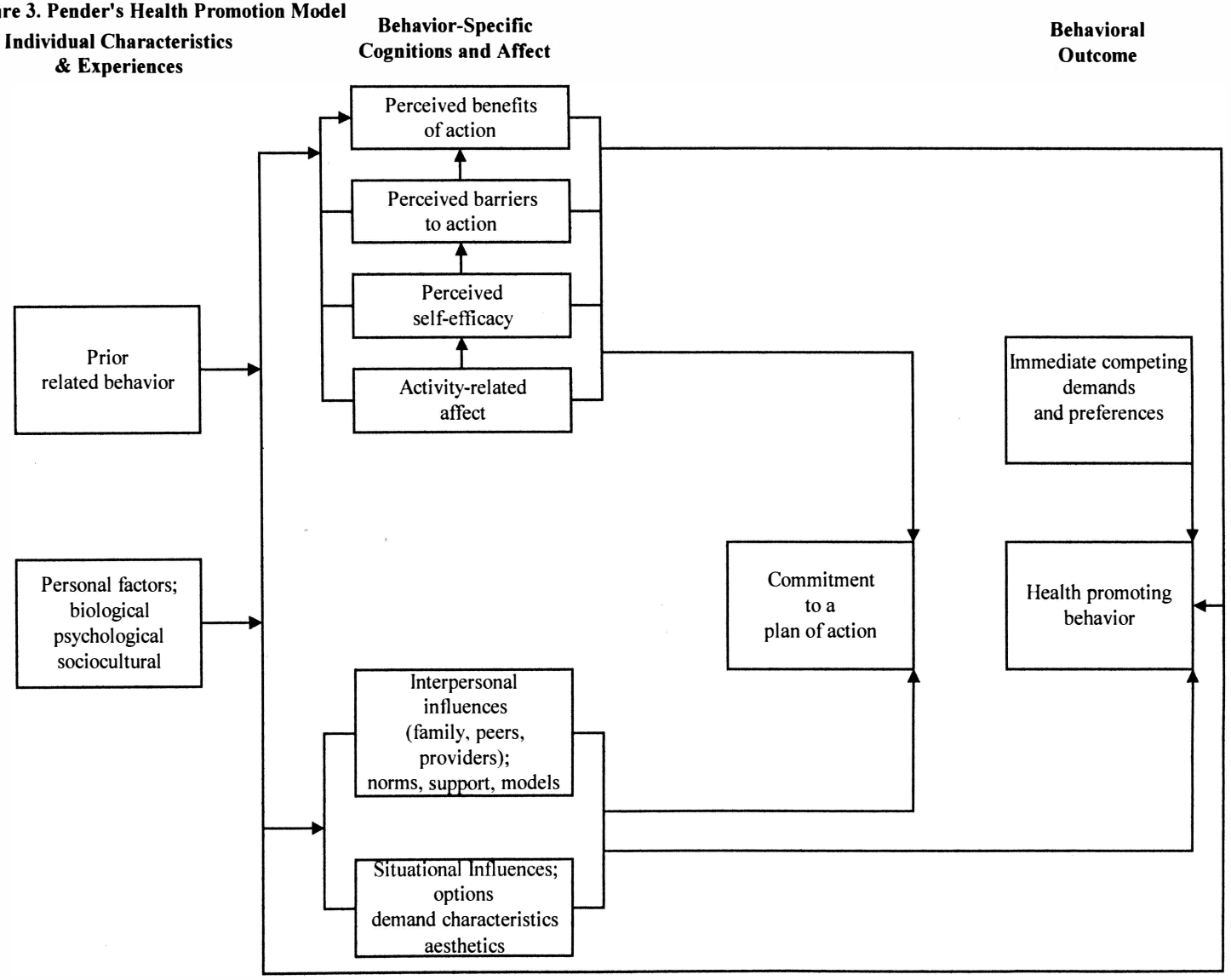
to increase the value of performing an activity is to associate it with pleasure or fun. In the case of aquatic exercise, for example, the pregnant woman may associate the feeling of weightlessness in water with pleasure.

Becker (1974) developed the Health Belief Model based on Lewin's work as a framework for exploring why some individuals who are illness-free take action to avoid illness, whereas others fail to initiate protective actions. According to Becker (1993), before a person takes action, one must determine that a behavior, such as eating a fatty diet, could create a serious health problem. In contrast, a person also evaluates whether moderating that behavior would help him/her avoid disease.

Theoretical Concepts

Both Pender's original and revised Health Promotion Models (1987, 1996) are based on the social cognitive and expectancy-value theories, and her models also expand Becker's Health Belief Model. Pender's revised Health Promotion Model (1996) expands Becker's model by proposing that individuals should develop lifestyles and patterns of behavior to enhance their health, not just to avoid disease (Figure 3). The revised model focuses on three components: (1) individual characteristics and experiences, (2) behavior-specific cognitions and affect, and (3) behavior outcome. A fourth component, health outcome, which Pender addressed but excluded from her model, is an integral part of the proposed conceptual-theoretical-framework because of the intent to measure the effects of adopting a behavior.

Figure 3. Pender's Health Promotion Model



The first component, individual characteristics and experiences, comprises the distinctive attributes of the individuals being studied (Pender, 1996). These variables have both direct and indirect effects on behavioral outcomes. Accordingly, one's prior history and personal factors can affect one's choice of actions and behaviors in subsequent situations. Pender characterized personal factors as biological, psychological and sociocultural factors.

Pender's second component, behavior-specific cognitions and affect, is the critical core of her revised Health Promotion Model. These variables have significant motivational effects on an individual's selection and adoption of a health-promoting behavior. The variables are: (1) situational influences, (2) interpersonal influences, (3) activity-related affect, (4) perceived self-efficacy, (5) perceived barriers to action, and (6) perceived benefits of action.

With regard to the proposed study, a situational influence would be the pregnancy. An interpersonal influence might be the presence, lack or absence of family support. An activity-related affect might be the belief that aquatic exercise during pregnancy has positive or negative effects; a perceived barrier to participate in the exercise might involve the physical changes caused by the pregnancy. A perceived benefit might be increased mobility in and out of water.

The third component, commitment to a plan of action and behavioral outcome initiates a behavioral change and will propel individuals to change a behavior. Impediments to the plan of action are competing demands and preferences. Demands are defined as conflicts that an individual has little control over, such as family illness or

unexpected work demands. In contrast, competing preferences are alternative behaviors such as going to the movies versus attending the exercise class.

The fourth component, health outcome, such as a decrease in maternal discomfort, is a desired effect that acts as its own re-enforcer of the behavior. For example, pregnant women involved in a pilot study of the exercise component of this study, reported relief from pregnancy discomforts for 24 to 36 hours after exercise. An additional benefit may be an increased mobility out of water, which would allow the pregnant woman to maintain her functional status.

Empirical indicators

This study focused on specific individual characteristics and experiences, behavior-specific cognitions and affect, behavioral outcome and health outcome. The indicators of individual characteristics and experiences for the proposed study were: (1) biological factors: the pregnant woman's age, body mass index, gestational age, gravidity; (2) sociocultural factors: demographics, previous exercise participation; and (3) psychological factor: body image.

The empirical indicators for behavior-specific cognitions and affect are self-efficacy and barriers to action. It was hypothesized that pregnant women who experience the physical changes of pregnancy as limitations or impediments to exercise will be more likely to refrain from exercising or dropout. However, exercise in an aquatic environment is said to diminish these limitations or barriers (Sova, 1991; Telleen, 1993). Moreover, the activity-related affect component of an aquatic exercise intervention program must

suggest that the exercise will relieve the discomforts of pregnancy, which, in turn, will enhance a participant's perceived self-efficacy.

The empirical indicator for the behavioral outcomes component was be the level of health promotion, as measured by the Health-Promoting Lifestyle Profile. A change in the participants' level of health promotion was used to determine the exercise intervention effects on lifestyle behavior change.

The empirical indicators of health outcome were: mobility and the maternal discomfort. Specifically the three most reported pregnancy discomforts are back pain, edema, and leg cramps.

Significance

Much of the information in the pregnancy pain literature focuses on helping women cope with pain of labor and birth rather than pregnancy pain and discomfort. There has been a paucity of research on relieving the clinical manifestations of maternal discomfort. Previous research has predominately been on strengthening and stretching muscles as a treatment for back pain. There have been no studies involving aquatic exercise, even though swimming is advocated by the American College of Obstetrician and Gynecologists as one the best exercise for pregnant women.

The pregnancy and exercise research literature has predominantly involved white women from upper echelon of the financial bracket. This study sample may be more representative because it attempted to ensure that pregnant women from various walks of life and different racial identities were able to express their individual differences and

experiences with aquatic exercise. It opened up the possibility of new and more utilitarian information.

Maternal research has traditionally focused on the aspects of women's health within the narrow boundaries of reproductive outcome. Women's health perspective research needs to focus on developing health promoting behaviors (Walker & Wilging, 2000).

CHAPTER 2

Review of the Literature

This chapter focuses on the current research literature relevant to the study reported here about the impact of aquatic exercise on pregnant women. The specific areas of study are exercise during pregnancy, pregnant body image, health-promoting behaviors among pregnant women, pregnancy related discomforts, and maternal mobility. An extensive electronic search using the Cumulative Guide of Nursing and Allied Health, Pub Med, Grateful Med, and Psychological Abstracts, showed that the body of background knowledge on pregnancy and exercise-based interventions for pregnant women comes predominantly from studies about the effects of exercise on fetal outcome. The second most frequently listed item in this search was exercise safety guidelines for pregnant women. There has been a paucity of published research with regard to pregnant body image, health-promoting behaviors practiced by pregnant women, maternal discomforts, maternal mobility and aquatic exercise during pregnancy. The aim of this study, then, was to make a contribution to knowledge by investigating a topic that has been essentially ignored.

Pregnant Body Image

Adam's rib, Aristotle's "infertile male" and Galen's "cold embryo" are historical depictions of the female body and what Simone de Beauvoir refers to as the "Second

Sex". Women's bodies have always been abstracted as some "thing". For women, this has meant an abstracted body image--one characterized by inferiority or peculiarity.

Pregnancy further complicates the woman's body image by bringing new physical challenges and conflicting social perceptions to the woman. During the Renaissance era, Descartes conducted a scientific study about the anatomical nature of the human body. He argued that the human body image does not affect human intellectual capacity (Cohen, 1991). The only differences between males and females are biologic in nature. Only the female is capable of birthing and sustaining the next generation. Young (1990) espoused that pregnancy constitutes a paradigm of bodily experiences in which the transparent unity of the woman dissolves for a temporal period while embodying her unborn.

The concept of body image refers to the psychological experiences and beliefs that individuals have about their bodies. The term "body" reflects the physical structure, bones and skin of a person (Webster, 2000). It is derived from a twelfth century French word *bodig*, meaning the bones or trunk covered by skin. Image comes from the thirteenth century Latin word *imago* meaning likeness or impression. Schilder (1950), a Gestalt psychologist, defined the concept of body image as "...the picture of one's own body which we form in our mind" (p.11). This definition was generated by his work on *Korperschema* (scheme of the body). In it, Schilder reflected on the need for body wholeness. He thought that body image is more than the physical presence or size of one's shadow--that is, body image incorporates the dimensions of an inner self and spatial gestalt. The inner-self dimensions combine the emotions, attitudes, and sexual

nature of the body (Martin, 1992; Richardson, 1990). Body image then is a composite of the experience one has with one's body as it really is--body reality--and one wishes it would be--body ideal. (Brumberg, 1997; Lorber, 1998; Price, 1990). Merleau-Ponty (1962) believed that body image is perceptual. A woman sees herself as through an inner eye and reflects on that image from afar.

Traditionally, the concept of a woman's body has been viewed from the male perspective. For example, the biblical creation story plants the idea that the female was a secondary thought, e.g. "It is not good for man to be alone; let us make him a helper" Genesis II, 18-23 (McClellan, 1941). Mahowald (1983) assumed that the biblical view of the female meant her role as a helper applied to the work of procreation. As the centuries passed, philosophers continued to ponder the creation, nature and role of the female, imparting myths that have been in use for thousands of years. Aristotle championed the conception of woman as an infertile male who lacked the power to produce semen because of her cold nature, but she was necessary because her menstrual flow provided nourishment for the unborn (Cohen, 1991). From the fourth century BC to the late seventeenth century, the sex of an embryo was thought to be determined by heat. Galen, a seventeenth century physician, continued to preach the science of Aristotle. He mistakenly taught medical students that the uterus and vagina were simply an inverted form of the scrotum and penis and that a cold embryo was unable to cause the extrusion of the external male body parts.

Throughout history, women experienced social pressures to maintain acceptable appearances, from lacing corsets to wearing thong underwear. Contemporary research

reveals some disheartening findings about the negative state of women's body images. We now know that negative feelings are being fostered from childhood on. Measures of self-esteem by young women decline decidedly around puberty and continue to decline as they grow to adulthood (Smith, C., 1998). Women's discontent with their bodies manifests in a variety of ways, including eating disorders. Not only do researchers say eating disorders among woman are symbolic of their struggle to conform to an ideal cultural body image but eating disorders are on the rise in the female population (Brumberg, 1997; Smith & Condit, 1998). The bulk of body image research, however, targets nonpregnant women. Few studies examine how pregnant women perceive their body image.

Although, modern Western medicine learned much about the biology of pregnancy, sex determination and conception, and made great strides in sustaining healthier pregnancies and deliveries. One of the unfortunate byproducts of the medicalization of pregnancy is the concurrent marginalization of the pregnant woman (Hofmeyer, et al., 1990; Smith & Condit, 1998). Some say that the pregnant woman is merely a container for the unborn. The objectification of pregnant women led to a subtle but unavoidable paradox. For almost a century physicians associated pregnancy with the highest level of a woman's body, but William's Obstetrical textbook features no depiction of the full-faced normal pregnant woman (Smith & Condit, 2000).

Women have been conditioned to believe that pregnancy is a reflection of femininity (Bashford, 1998). Smith and Condit (1998) analyzed one of the most widely read magazines about and for women, "Ladies Home Journal". Issues from 1899 to 1999

were studied. Dividing the female image into four categories--child, adolescent, bride, and mother--Smith and Condit found that pregnancy was undermined (perverted) as a hidden phase in a woman's life. For example, in older issues, advertisements of maternity clothes were wedged in between corset or personal hygiene pictures. More current issues focused on how exercise programs help to regain the female figure but the magazines carried no articles about how and why the figure changes. Other contents of the magazine exhibit a similar conflicting message about the social acceptability of the pregnant body.

Numerous studies have focused on the postpartal body of women and spouses body image changes during and after pregnancy. Strang and Sullivan (1985) studied postpartum women's body image attitudes. They reported primigravidas were more distressed with pregnancy-related residual weight gain. Fawcett (1989) followed couples throughout the pregnancy and postpartum experience. As the pregnancies progressed, pregnant women's body image attitude declined and remained low during the postpartal period whereas their spouses' image remained unchanged during this period. Walker (1998) examined the aspect of psychological suffering as it related to postpartum weight retention. In her analysis, she determined that almost 50% of the women she interviewed reported an increase in body image distress. Those in the more distressed group started their pregnancy with a higher body mass index and lower exercise level. What these studies imply is that pregnancy tends to be a long-term cause of women's problems with regard to weight and body image (Walker, 1998; Walker & Wilging, 2000).

The relationship between pregnancy and body image has been studied by numerous researches. Hofmeyer et al. (1990) surveyed almost 800 pregnant women

concerning their perceptions of body image and attractiveness. Fifty-three percent of the women viewed their body as less attractive. Richardson (1990), who interviewed pregnant women to obtain their descriptions and perceptions of their pregnancy experience, categorized the body changes into four phases: (1) reductionistic (conception to 20 weeks gestation), (2) expansion (21-26 weeks), (3) tension (27-32 weeks), and (4) stabilization (33 weeks to delivery). The third phase, "tension," was the most negative phase characterized by worrisome changes in body image. Fox and Yamaguchi (1997) researched the relationship between pre-pregnant body image and pregnant body image of normal and overweight primigravidas. Interestingly, overweight women reported a more positive body image at 30 weeks gestation than at the pre-pregnant state. This suggests that pregnancy is a condition making overweight women feel less stigmatized because the weight is now related to pregnancy. In contrast, the normal-weight participants associated pregnancy with a negative body image. These three studies, although essential to our newly gained understanding of pregnancy, are not a sufficient basis for making our knowledge of the subject integrated and coherent. The limitation in these and other mentioned studies is their lack of sample diversity. They are all descriptive in design with samples comprised of well-educated, white pregnant women.

Health Promoting Behaviors of Pregnant Women

To determine the health-promoting behavior differences practiced by pregnant women, Kemp and Hatmaker (1992) conducted a descriptive study. The non-randomized small sample of high-risk and low-risk pregnant women had a mean income of less than $15,000 a year and attended a university-based prenatal clinic. Sixty-five women, 43

African-American and 22 Caucasian, completed the Health Promoting Lifestyle Profile (HPLP) developed by Walker, Sechrist and Pender (1987). Those who were classified as high risk were less likely to participate in health-promoting behaviors before and during their pregnancy. There were statistical differences between the two in the areas of self-efficacy and health responsibility scales.

Women are inclined to take better care of themselves during pregnancy (Low, 1993). They tend to seek prenatal care to insure a safe passage through the pregnancy, labor, and delivery (Rubin, 1976). Because of their concern about the pregnancy and birth outcome, women are more likely to be receptive to health-protective care and health-promoting practices (Telleen, 1993). Until recently, the focus of prenatal care was preventive, but in the new century health promotion may play a more active role (Pender, 1996). Fifty percent of American women are classified as sedentary (Felton & Parsons, 1994; Pender, 1996). Mothers are less physically active than women without children (Eyler, Brownson, King, Brown, Donatelle, & Heath, 1997; Verhoef & Love, 1994) therefore, introducing exercise during this receptive stage of a woman's life may help her to lead a more active life after pregnancy.

Maternal Discomfort

Family patterns have changed during the latter portion of this century. Gone are the close-knit extended families in which the multiparous women share their wisdom with the primigravida woman (Nichols, 1996). As a result, modern women tend to rely on the medical model of preparation for childbirth pain, receiving little guidance through their pregnancy discomfort experience (Jimenez, 1998; Simkin, 1996).

Pregnancy is not a solo journey. As the baby grows, the mother's hormones fluctuate, and her muscles stretch; she changes both physically and emotionally (Young, 1990). Her partner and family members share the external view and listen to her reports of inward changes. Casual dismissal of her nagging backache, indigestion, throbbing hemorrhoids, and awkward movements tend to undermine her sense of self-worth and her self-concept (Kitzinger, 1999).

"Discomfort" is difficult to define. Discomfort is the absence of ease, a hardship or mild pain, or unhappiness (Webster's, 2000). According to Kolcaba and Kolcaba (1991), there are two dimensions: internal/external needs (physical, psycho spiritual, social, and environmental) and intensity levels. Pain is derived from the Latin term *poena*, meaning penalty or punishment inferring a divine cause of this distress (Jimenez,1996; Maleska, 1981). The International Association for the Study of Pain defines pain as an unpleasant sensory and emotional experience arising from tissue damage (Flaherty, 1996).

Sternfeld, Quesenberry, Eskenazi and Newman (1995) conducted a larger, ethnically diverse study to determine how exercise during pregnancy affects the resulting pregnancy outcome. Pregnant women receiving care at a large HMO were selected as a convenience sample. 529 women who were recruited at their first prenatal visit (M = 16.5 weeks gestation), 67 were excluded due to medical complications and language barriers, and 63 dropped out. This left an adjusted sample size of 398. This is one of the few studies that had ethnic diversity: 77.1% were white, 10.7% African- American, 7% Asian and 5.7% Hispanic. All the participants were contacted by telephone three times during

the pregnancy to quantify exercise levels. Exercise levels were divided into four levels: (1) aerobic exercise, not including vigorous walking, with a frequency level of three times weekly; (2) aerobic exercise three times weekly, as well as vigorous walking; (3) aerobic exercise or vigorous walking once a week; (4) no aerobic exercise consistently. ANOVA was used to evaluate the continuous variable of infant birth weight. Chi Square analysis was used on categorical variable maternal discomfort. The outcome variable of infant birth weight showed no statistical difference. Those participants in exercise levels 1 and 2 reported less pregnancy-related discomforts in both the first and second trimesters of pregnancy. Women exercising at levels 1 and 2 had significantly less discomfort than those in level 3 and 4 ($p = 0.02$).

Low back pain in pregnancy is related to postural adjustments made to accommodate the physical changes of a protruding abdomen and joint laxity related to hormonal changes (Romen, Masaki, & Mittlemark, 1991). The protruding abdomen changes the woman's center of gravity, causing a lumbar lordosis to maintain balance. The stretching of the abdominal muscles causes a shortening of two major back muscle groups, the latissimus dorsi and sacrospinalis muscles (Artal, 1996; Raush, 1989). Parsons (1994) describes the psoas muscle--which stabilizes the lumbar spine and is involved in hip flexion--as one of the culprits involved in low back pain (Parsons, 1994).

Approximately 50% of pregnant women complain of low back pain problems (Davis, 1996; Ostgaard et al., 1994). According to Fast, Weiss, Ducommun, Medina, and Butler (1990), ten percent of women are so immobilized by severe back pain they are unable to perform their activities of daily living. Ostgaard and colleagues reported that

70% of Swedish women used sick leave because of pregnancy induced back pain. These investigators conducted a prospective randomized intervention study to determine the effects of an educational and exercise program on the incidence and intensity of low-back pain associated with pregnancy and posterior pelvic pain. The sample consisted of 407 participants who were randomized into three groups. The women enrolled in the study were between 16 to 18 weeks pregnant at the pretest phase. Control group A was interviewed concerning the incidence of back pain. These participants were asked to identify the location of their pain on an anatomical drawing. Additionally, Group A was instructed to rate the intensity of their pain using a visual analog scale. Group B participated in a two-session back education program focusing on a review of anatomical causes of back pain, proper lifting techniques and posture tips. Group C participated in an ongoing, individually designed back education program focusing on the topics for Groups A and B. Group C also received an audio cassette of their specific back program for use at home. The post-test questionnaire pain measurements were administered when the pregnant woman reached 36 weeks gestation. The results indicated that women who consistently participated in a proactive education program and exercise prior to and during their pregnancies reported a lower incidence of low back pain and improved mobility ($p< 0.05$). The result was that sick leave absences due to pregnancy induced back pain decreased significantly ($p <0.01$).

Parsons (1994) presented an exercise intervention program that started in the first trimester of pregnancy. It combined stretching and abdominal strengthening exercises to be used until the 20th week of pregnancy. During the second trimester, exercises to

increase flexion and extension of the lumbar sacral area were added. Combining these with a squatting exercise promoted relaxation of the psoas muscle. Parsons, who has used these exercises in her midwifery practice, noted that her patients' low back pain decreased, had less leg cramps, and improved mobility; however, she has not formally tested her intervention program.

The next most common complaint that pregnant women express is lower extremity edema. This edema causes discomfort and decreases mobility (Katz et al., 1990). Katz and colleagues conducted a quasi-experimental design study to compare non-weight bearing cycling exercise and aquatic exercise. Pregnant volunteers were recruited at 25 weeks gestation. Participants were asked to have a rectal temperature probe in place throughout the testing, and they wore nasal prongs throughout each 45-minute sessions. Maternal temperature and blood pressures were lower in the aquatic group. The urine samples collected after each type of exercise indicated a greater diuresis after immersion. There was a statistically significant difference between the urine values.

Mobility

The literature focusing on mobility problems with pregnancy is negligible. The concept is addressed more as a problem of inactivity, being sedentary, or having activity intolerance. In the physical therapy literature, emphasis on exercise research focuses on preventing injury and maintaining a self-environment for maternal exercise (Shangold & Mirkin, 1994). Dumas and Reid (1997) conducted a longitudinal quasi-experimental research study on the problems of joint laxity during the later half of pregnancy. Subjects were recruited during their first trimester. Subjects were required to have a sedentary

lifestyle prior to enrollment in the study. Knee laxity, anterior and posterior crucicate, was measured using an arthrometer. The exercise program was designed according to the guidelines from the Fitness and Amateur Sports of Canada. Data were collected in each trimester. The exercise group (N = 27) participated in a knee strengthening program throughout their pregnancy. The sedentary group (N = 37), who engaged in no formal exercise program showed an increase in joint laxity problems as the pregnancy progressed. The sedentary group was more likely to fall and reported feeling less mobile.

In the pregnancy related exercise literature, researchers have reported that pregnant women tend to decrease or cease their exercise activities around the twentieth week gestation (Clapp, 1998; Fast et al., 1990; Ostgaard et al., 1994). Shopping areas have stork spaces next to the handicapped parking indicating that the public recognizes the mobility problem even if the quantity of published literature does not reflect the magnitude of the problem.

Although the reviewed studies are unrepresentative, with small samples, that lack cultural diversity and randomization, the third trimester is clearly the most difficult phase for pregnant women. Exercise may reduce excess weight gain, and ease pregnancy discomforts and as well as help the woman be mobile throughout the pregnancy.

Exercise during Pregnancy

Historical Perspective. Physical fitness and the ease of pregnancy and childbirth were first mentioned in the Bible. Physical activities of manual labor and housekeeping kept Hebrew women active until delivery. It was felt that this physical activity played a part in smaller babies and easy labor for Hebrew women (Artal & Gardin, 1991; Noble

1995). In comparison, Egyptian women, who led a more sedentary lifestyle, were predisposed to having larger babies and pelvic dystocia (Artal & Gardin, 1991).

Aristotle reported the need for women to remain active during their pregnancy or they would face the consequences of increased pregnancy discomforts and difficult childbirth (Artal & Gardin, 1991). In 1788, Dr. James Lucas presented a paper to the Medical Society of London supporting the benefits of exercise for pregnant women (Noble, 1995). In 1835, Curtis published Obstetrics: Lectures on Midwifery and the Forms of Disease Peculiar to Women and Children, one of the first American obstetric textbooks advocating that pregnant women be active in the fresh air to benefit their pregnancies.

As the centuries passed, concerns were expressed about the dangers of robust exercise versus exercise in moderation. The twentieth century brought about a distinction between vigorous and moderate exercise. Walking two to three miles a day was recommended, but walking six miles was considered too robust (Artal & Gardin, 1991).

In 1968, Dr. Kenneth Cooper changed the meaning of *aerobic* from an adjective meaning "growing in oxygen" to the noun "endurance exercise" requiring more oxygen for cardiorespiratory systems (Cooper & Cooper, 1989). But Dr. Cooper's intention was to provide guidance for men and exercise, not women. Later, with the support of his wife Mildred, they produced The New Aerobics for Women, one of the first exercise books that recognized the special needs of exercising women, such as hormonal issues, pregnancy and osteoporosis.

Maternal Physiological Adaptation to Pregnancy

The childbirth year, from conception through the perinatal/postpartal transition, places a woman's body in a continual physiological adaptive state. Though pregnancy is not an excuse to "gestate" to a sedentary lifestyle; neither is it a time to start an athletic/competitive sport. Exercise and pregnancy are two of the most profound normal physiological adaptations a human being is able to experience because the human body is obviously resilient. Exercise causes an increase in cardiac output and oxygen consumption, as well as changes in blood flow distribution. The important information about physiological changes during pregnancy is described in the next section.

From 8 to 34 weeks of gestation, pregnant women's blood volume increases by 40% and their body mass by 13%. Cardiac output rises secondarily to increases in heart rate and stroke volume (Pivarnik, Lee, Clark, Cotton, Spillman, & Miller,1990). The maternal heartbeat at rest increases to between 10 and 15 beats per minute and her red blood cell level increases 25 to 30% by the time she reaches term. Simultaneously, her plasma volume rises by 45%. Because this increase in plasma level exceeds the red blood cell mass, the result is physiological anemia. Retrospectively, cardiovascular changes and uterus expansion may impede venal caval blood flow in the supine position and thereby cause postural hypotension. During the third trimester, cardiac output is enhanced when a left or right lateral tilt is maintained in the recumbent position (Clark, Cotton, Pivarnik, Lee, Hankins, & Benedetti (1991).

The result of the expanding uterus during pregnancy is a reduced lung capacity, gradually reduced by approximately 300 ml. The body adjusts to the reduction by the

flaring of the lower ribs and an increase in the transverse diameter of the thoracic cavity (Carpenter, 1994). The expanding uterus also causes the diaphragm to rise approximately 4 cm. The respiratory center then has a lower threshold to blood levels of carbon dioxide, which in turn causes a faster respiratory rate (ACOG, 1994). Late in the third trimester, oxygen consumption has increased approximately 36% and is proportional to the increase in body mass (Carpenter, 1994). Other discomforts associated with the intensified respiratory effort are nasal stuffiness or congestion related to altered hormone levels, which may cause distress during some forms of exercise.

The physical changes of pregnancy produce significant changes in balance, posture, and mobility. The protruding abdomen, enlarged breasts, and the anterior rotation of the pelvis cause a change in the center of gravity and a secondary lumbar lordosis. To maintain a stable body position, the pregnant woman tends to increase the burden on the muscles of her back and vertebral column. This explains the prevalence of back pain during pregnancy (Carpenter, 1994: Davis, 1996; Noble, 1995). An additional cause of back pain is the shortening of the hip flexor muscle group secondary to anterior rotation of the pelvis and the increased size of the abdominal muscles (Carpenter,1994; Noble, 1995; Parsons, 1994). A sedentary lifestyle may increase back pain and other discomforts. Stretching and strengthening muscles can help ease or prevent the discomforts of pregnancy. Increased levels of estrogen and relaxin cause a relaxation of the joints and ligaments and make a pregnant woman vulnerable to injury during weight-bearing exercises that require rapid change in direction.

Pregnancy causes an increase in basal metabolic rates (BMR) because of the elevated activity of maternal tissue and heat generated by the growing fetoplacental unit production. This increase of the BMR explains the need for the pregnant woman to increase her daily caloric intake by 300 kilocalories. The combination of the physiological changes and the increase of adipose tissue insulation make women feel warmer even at a resting state. Research on maternal thermoregulation demonstrates that hyperthermia, specifically in the first trimester, can produce adverse effects on fetal development (McMurray, Katz, Meyer-Goodwin & Cefalo, 1993). Two elements affect the maternal temperature: intensity and duration. Pregnant women who exercise for 30 minutes with an average heart rate of 140 beats per minute will increase their core temperature 0.4° Centigrade. Clapp (1991) also studied the effects of intensity and duration on maternal temperature by following women from preconception through the 37th week of gestation. Pregnant women who exercised at 64% of Vo_2 showed changes of 0.3° to 0.8° C occurring 10 to 20 minutes long. As maternal temperature elevates, the fetal temperature increases and ranges from 0.5° to 1° C. Animal research has shown tetra genic effects of hyperthermia during the first trimester indicating a temperature above 39° C will impede neuronal cell development in pregnant animals.

The dissipation of heat depends on the principles of convection, evaporation, and radiation. Convection and radiation will transfer heat to the environment; thus, pregnant women need to be reminded to wear loose-fitting attire during exercise (Drinkwater & Artal, 1991). To facilitate evaporation, women need to hydrate themselves before, during, and after exercise. Women who are more fit tend to maintain a cooler temperature

because of a more efficient cardiovascular system circulating blood from the muscles to skin surfaces (Clapp, 1991). Avoiding maternal/fetal hyperthermia is one of the primary rationales for both the American College of Obstetricians and Gynecologists (ACOG) and the American College of Sports Medicine (ACSM) in establishing safety guidelines for prenatal exercise intensity and duration. Pregnant women who participate in exercise need to be instructed how to monitor their exercise intensity level. Two common measures used are the talk test and the perceived level of exertion scale. As a measure of intensity, fitness instructors will frequently monitor participants' ability to engage in conversation during an exercise. The more effective measure is the Perceived Level of Exertion Scale developed by the physiologist Gunnar Borg. His scale represents an individual's perception of exercise intensity and energy expenditure (Borg, 1982). Borg's research has shown a correlation between an exerciser's perceived level of exertion and blood lactate levels.

Of primary concern to the pregnant family and health care providers is the effect of exercise on the unborn baby. Researchers have hypothesized possible tetragenetic effects of hypothermia and hypoxia based on animal research. Since the human fetus is not easily accessible for direct observation during maternal exercise, the fetal heart rate has been the most prevalent indicator of fetal well-being.

Visceral splanchnic perfusion decreases linearly as circulation increases to the exercising muscles (McNitt-Gray, 1991). However, the decrease in oxygenation does not increase the lactate level. This would indicate that the fetus has enough oxygen reserve to sustain aerobic metabolism during 30 to 40 minutes of exercise (Carpenter, 1994).

Numerous researchers have reported an increase in the fetal heart rate of five to 20 beats per minute (Bell, O'Neill, Rehab, 1994; Clapp, 1990). Clapp (1998) studied participants who exercised more than 75% of maximum intensity on a cycle ergometer. Although there were brief episodes of bradycardia--less than 110 beats per minutes--all of the fetuses had a normal Non-Stress Test within 30 minutes of terminating the exercise.

Maternal Exercise: Perinatal and Fetal Outcome Research

Clapp (1998) generates the following conclusions in his book Exercising through your Pregnancy: women who exercise before and throughout their pregnancy will gain less weight and have shorter labors, fewer discomforts, and a speedier postpartal recovery. Of concern, however, is that the contents of his work is inferred from samples of white, well-educated women from middle to high socioeconomic classes.

Clapp, Little and Capeless (1993) hypothesized that exercise-induced changes in fetal heart rate are influenced by multiple confounding fetal, maternal, and exercise variables. One hundred-twenty healthy recreational athletes, exercising for a minimum of 20 minutes three times per week, participated in a longitudinal study to investigate the relationship of exercise intensity and fetal heart rate response. All participants' fitness levels were evaluated preconceptually in order to control for intensity ability. Fetal heart measurements were taken at 16, 26, and 34 weeks gestation. Ninety-seven percent of the fetal heart rates increased in response to exercise, 15 ± 11 bpm. The magnitude increased with fetal maturation and exercise duration. Additionally, the maturing fetus was less affected by increases in maternal temperature caused by exercise intensity and duration.

Clapp (1989) researched the effects of maternal exercise on early pregnancy outcomes. One hundred nineteen well-educated white women were enrolled during several months prior to becoming pregnant. The subjects' fitness levels were evaluated and categorized into three groups: recreational runners (49), aerobic dancers (41), and intermittently physically active (28). Serving as controls, the latter group was asked to stop exercising before and during their pregnancy. Participants' pregnancies were confirmed by B-hCG within 48 hours of missing menstrual period followed by ultrasound viability confirmation by 6 weeks post conception. Pregnancy occurred in 97% cases of the sample. Spontaneous loss occurred in 19% of the pregnancies. Loss percentage by group was as follows: recreational runners 17%, aerobic dancers 18%, and control group 25%. Clapp concluded that exercise does not alter pregnancy outcome or increase the incidence of spontaneous pregnancy loss.

Clapp continued to study the effects of exercise on pregnancy outcome. In 1990, he investigated the effects of endurance exercise--running or aerobics--on the course of pregnancy, labor, and delivery. Sixty-seven runners and 64 aerobics participants were monitored prior to and throughout their pregnancy. To determine an individual's exercise performance ability, each of the participants' maximum oxygen consumption was calibrated. Once pregnancy was confirmed, the women's exercise level, duration-intensity index, and fetal heart rate were monitored every six to eight weeks throughout their pregnancy. As the pregnancies progressed, the women split spontaneously into two groups. Forty-four of the women stopped exercising prior to the completion of their first trimester. The incidence of preterm labor before 37.5 weeks' gestation was 9% in each of

the groups. Women in the group who continued to exercise went into spontaneous labor five days earlier than those in the group that did not exercise. Additionally, the exercise group had less obstetrical intervention, labor stimulation, episiotomy, epidural anesthesia, and Cesarean deliveries, as well as shorter active phase labor.

Sternfeld and colleagues (1995) also researched the effects of exercise on pregnancy outcome. The purpose of their study was to determine the effects of aerobic exercise on birth weight, maternal weight gain, gestational age at delivery, and discomforts of pregnancy. One of the major differences between this study and Clapp's work is the characteristics of the sample. Three hundred eighty-eight primarily well-educated pregnant women were interviewed in person at the mean gestational age of 16.5 weeks to determine prepregancy exercise history and current level of physical activity. After the interviews, the sample was categorized according to four levels of activity: (Level 1) aerobic exercise excluding vigorous walking at least three times per week for 20 minutes duration; (Level 2) aerobic exercise, including vigorous walking, at the same frequency and duration as Level 1; (Level 3) aerobics less than three times per week; (Level 4) aerobic exercise less than one time per week. Two follow-up phone interviews were conducted at mean gestational ages of 26.2 and 36.3 weeks.

There were no adverse effects or group differences on the outcome variables of birth weight, weight gain, and gestational age at delivery. Of interest was the change in exercise patterns of the study participants. Forty-one percent of the sample exercised at Level 1 prior to pregnancy. By the third trimester, only 14% of the women exercised at Level 1. The least active group (Level 4) increased from 28% to 63%, while Levels 2 and

3 remained relatively constant. Additionally, the women changed from weight-bearing to non-weight-bearing exercises, primarily swimming. Women who exercised at the higher level reported fewer pregnancy-related discomforts.

Maternal weight gain is a normal physiological phenomenon of pregnancy. During the first half of a pregnancy, the weight gain is associated with increases in circulatory volume and percentage of body fat (Smith, 2000). Later in pregnancy, the weight gain is associated with the growth of the products of conception and fluid retention. Clapp and Little (1995) designed a study to evaluate the effects of recreational exercise on the time-specific weight gain rate of pregnant women. Seventy-four women were enrolled in an exercise study preconceptually. Thirty-one women whose activity level was minimal prior to pregnancy agreed to avoid exercise during their pregnancy. Each of the women's body mass indices was calibrated, five site body fat measurements were obtained, and exercise capacity was measured. The participants were asked to keep an exercise log and nutritional diary. As the women's pregnancies progressed, weight checks and body fat percentages were measured every seven weeks. Results indicated that exercising throughout pregnancy does not influence weight gain or subcutaneous fat deposition during the first and second trimesters. Pregnant women who continued to exercise however, gained less weight and deposited less fat during the third trimester.

A study conducted by Rice and Fort (1991) demonstrated that the profession of physical education and recreation sports were concerned about the effects of exercise on pregnancy outcomes. The research methodology involved interview and data collection from medical records. Twenty-four pregnant women were interviewed to ascertain

exercise level: active versus sedentary. Twelve active women were engaged in a regular exercise program three times a week for a minimum duration of 30 minutes. The primary exercise level was walking at 65% intensity level based on maximal heart rate calibrations. The participants were interviewed a second time two to five days post delivery. At that time, they were asked to rate their perceived level of exertion during labor. The Borg Perceived Level of Exertion scale was used as a measurement instrument. Labor and delivery data collected from medical records consisted of the following: medication use, fetal weight, Apgar score, maternal weight, and gestation at the time of delivery. The only significant differences between the groups were that active women reported lower perceived-level of exertion scores and their babies had higher one minute Apgar scores. Maternal weight gain correlated to fetal weight. It is not surprising that obese women rated their exertion level higher and had larger babies.

Guidelines for Exercise during Pregnancy

Women seek prenatal exercise programs to promote flexibility, to enhance muscle strength, and to challenge the cardiovascular system. Until the 1980s, guidelines for physical activity were based on common sense. An increased interest in exercise during pregnancy challenged ACOG and ACSM to develop safety guidelines. In 1985, ACOG published the first formal guidelines for pregnant women and exercise (ACOG, 1985). In 1986, the ACSM presented its recommendations because it felt ACOG's were too stringent (Yeo, 1994). In response to many research activities on the effects of exercise on pregnancy outcome, both medical organizations updated their guidelines in 1994 and 1995 (ACOG, 1994; ACSM, 1995; Yeo, 1994)).

According to ACOG (1994), there has been no evidence to indicate that healthy pregnant women need to limit exercise or lower heart rates because of potential of adverse effects. The following summarizes the ACOG safety guidelines:

1. Exercise at least three times per week.
2. Women should avoid exercise in the supine position after the first trimester and avoid prolonged periods of motionless. Prolonged periods of standing increase the incidence of lordosis.
3. Women should be aware of the decreased oxygen available for aerobic exercise during pregnancy. Pregnant women need to modify intensity according to maternal symptoms and fatigue levels.
4. Exercises that could cause loss of balance or falling should be avoided, and pregnant women should rise slowly from the floor.
5. Pregnancy requires an additional 300 kcal per day. Women who exercise need to have adequate diets.
6. Hydration needs to be met pre-, during, and post-exercise.
7. Postpartal exercise levels should be resumed gradually.
8. A period of warm up and cool down in all forms of exercise should be included.
9. Ballistic exercises should be avoided, and pregnant women need to be mindful that joint laxity can cause over stretching or strain.

(ACOG, 1994; Carpenter, 1994)

Contraindications for Exercise during Pregnancy

According to ACOG (1994), the following conditions are contraindications to exercise: pregnancy-induced hypertension, preterm rupture of membranes, preterm labor during a prior or current pregnancy, incompetent cervix/cerclage, persistent or intermittent bleeding in the second and/or third trimester.

Pregnant women need to seek guidance about their participation in exercise programs during each of their pregnancies. Many programs require written permission from the health care provider. The participant should be guided to contact her health provider if any of the following signs or symptoms occur: any type of pain, including back or pubic, bleeding dizziness, shortness of breath, faintness, and/or heart palpitations (Carpenter, 1994).

Aquatic Exercise during Pregnancy

In reviewing exercise patterns of pregnant women, it was noted there is a large dropout factor or change in the type of exercise after the end of the first trimester. One of the most frequently selected types of programs is swimming or aquatics. Pregnant women may select a water-based exercise program because of its buoyancy and hydrostatic pressure.

Aquatic Principles

Archimedes (285-212 B.C.) discovered the principle of water displacement while stepping into a full bathtub. He determined that the volume of water that ran over the tub was equal to the volume of his submerged body (Hall, Bisson, & O'Hare, 1993). In Sova's words, "the Archimedes principle states when a body is completely or partially

immersed in a fluid at rest, it experiences an upward thrust equal (buoyancy) to weight of the fluid displaced" (1991, p.43). Besides buoyancy, a person who is exercising in a water environment is subjected to a gravitational force as explained by Newton (Sova, 1991). Buoyancy and gravity, then, help an aquatic-exercise participant to use both flexor and extender portions of a muscle group, which, in turn, decreases post exercise pain (Wolford, 1999). In contrast, land-based exercise tends to focus on the flexor portion of muscles. This distinction is especially important to pregnant women who experience back and leg pains caused by the flexion of the psoas and the contraction of the gastrocnemius muscles. Additionally, a pregnant woman's center of gravity changes because of the expansion of her abdomen, which puts her at risk of falling in land-based exercise programs (Hall et al., 1993; Koniak-Griffin, 1994). Buoyancy also helps the pregnant woman to feel less clumsy during an aquatic exercise program (Katz, 1995).

Another aspect of buoyancy is its effect on hydrostatic pressure changes. Hydrostatic pressure is defined as the pressure exerted by molecules of a fluid upon an immersed body (Wolford, 1999). During the immersion, hydrostatic pressure is increased in proportion to the depth of the water. "For every added foot of depth, the hydrostatic pressure increases by .433 pounds per square inch" (Sova, 1991, p 44). The effects of hydrostatic pressure and buoyancy increase venous blood return to the cardiovascular system, and in doing so, increase urinary elimination and reduce edema (McMurray, Hackney, Katz, Gall, & Watson, 1991). This is another benefit to the pregnant woman experiencing leg edema and leg cramps (Felton & Parsons, 1994). Hence, aquatic

exercise is a non-weight bearing exercise recommended both by the American College of Obstetricians (ACOG, 1994) and the American College of Sports Medicine (1995).

Research on Aquatic Exercise During Pregnancy

In a pilot study for the research reported here, a sample of 6 pregnant women self selected to exercise or not exercise. The participants ranged in age from 19 to 36 with a mean of 29. The majority of the sample was white/non Hispanic (75%). Most of the participants had at least some college (32%) and the remaining had completed graduate education. All pregnancies were carried to full term. Attendance rate for the exercise class was 90%.

Using a pretest/post-test format, the intervention group showed significant results on the reduction of back pain ($p = 0.03$ level). The self-reported discomfort of edema and leg cramps was ($p = 0.07$). There was a significant difference in mobility ($p = 0.003$). The exercise group improved their mobility while in the non-exercise group mobility ability decreased (Smith, S. 1998)

Summary

This chapter has reviewed the research literature on body image during pregnancy, health promotion activities of pregnant women, maternal discomforts of back pain, edema, and leg cramps and mobility problems. Aquatic exercise has been introduced as an intervention for discomfort and mobility problems.

CHAPTER 3

Methods

Using Pender's Health Promotion Model to guide variable selection, the purpose of this study was to determine how participation in an aquatic exercise program affects (1) pregnant body image, (2) pregnancy-related discomforts (back pain, edema, leg cramps), (3) pregnant women's mobility, and (4) health-promoting behaviors of pregnant women.

Six hypotheses were tested:

H_1: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have an improved level of body image as compared to pregnant women who do not participate in the aquatic exercise program as measured by the Pregnant Body Shape Questionnaire (PBSQ).

H_2: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a higher level of self-efficacy than pregnant women who do not participate in the aquatic exercise program as measured by the Perceived Health Competence Scale (PHCS).

H_3: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a lower level of barriers to health promoting behaviors than pregnant women who do not participate in the aquatic exercise program as measured by the Barriers to Health Promoting Behaviors Scale (BHPBS).

H_4: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have improved health promoting behaviors as compared to pregnant women who do not participate in the aquatic exercise program as measured by the Health Promoting Lifestyle Profile (HPLP).

H_5: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have less discomfort than pregnant woman who do not participate in the aquatic exercise program as measured by the Smith Pregnancy Discomfort Intensity Index.

H_6: Following completion of a six-week aquatic exercise program, pregnant women participating in an aquatic exercise program will have improved their mobility more than pregnant women who do not participate in the aquatic exercise program as measured by the Timed Get Up and Go Test.

Design

A two group quasi-experimental, pretest/post-test design was used. Quasi-experimental designs lack one of the two properties that characterize an experimental design, randomization or a control group. The randomized clinical trial is generally

regarded as the gold standard of research designs aimed at evaluating the effects of treatment on health outcomes (Cook & Campbell, 1979; Mark & Salyer, 1998; Pedhazer & Schmelkin, 1991). In a randomized clinical trial, each participant would have an equal and known chance of being assigned to either treatment or control group. Randomization would minimize the possibility of the confounding variable of self-selection bias (Brown, 1999). However, investigator experience in prior studies with pregnant women and clinical practice led to the decision to use a self-selection process. Recruitment of pregnant women to an exercise or non-exercise group would actually result in self-selection of study participation; the women who do not want to exercise would not participate if assigned to an experimental exercise group and visa-versa. Therefore women recruited to the exercise study were able to self-select group assignment. During a pilot program, women's reasons for not selecting the exercise program were as follows: water environment, location and time of the exercise program, commitment to a six-week program, and not wanting to exercise.

Sample

A convenience sample of 41 participants, 20 aquatic exercisers and 21 non-exercisers were recruited between October 24 and November 5, 2001. Participants were recruited from the Richmond metropolitan area. Twenty-six of the sample met the financial eligibility requirements for Medicaid funded health care. According to Lusk, Kerr and Ronis (1995), women of lower socioeconomic status and minority women score lower on health promotion knowledge and practice than do middle to high income white women. Until now, most subjects who have participated in pregnancy and exercise

research investigations have been white primigravidas who were from upper class and well-educated population (Lokey, Tran, Wells & Myers, 1991; Clapp & Little, 1995). The sample was ethnically diverse: 58.5% were Afican-American, 39% were White and 2% were Asian. Forty percent of the research sample were multigravidas.

Sample Size

The Aquatic Exercise Association recommends that class size be limited to 20 exercise participants because of participant safety (Sova, 1991). A power analysis to determine sample size was performed using the discomfort scores pilot data. The power analysis revealed that 40 participants in each group (exercise and non-exercise) would have 83% power to detect a difference in means of 0.700 (the difference between a control group mean of 2.500 and an exercise group mean of 1.800) assuming that the common standard deviation is 1.05 using analysis of covariance with baseline pregnancy discomfort index score serving as the covariate. With consideration given to both participant safety and statistical power, 20 participants were enrolled in the experimental and 21 in the control group. An additional person was recruited for the control group in the case possible attrition in the non-exercise group. One person withdrew from the control group because of medical complications, leaving 20 participants in each group.

Inclusion Criteria

According to the review of the literature, pregnant women tend to stop exercising around the twentieth week of gestation. This coincides with the appearance of the pregnancy discomforts of back pain and legs cramps (Oga, Shono, Kohara, Ito, Tanaka & Sugimori, 1995). Edema problems occur in the third trimester. Pregnant women's

mobility is impeded because of these discomforts and the physiological changes associated with pregnancy. Therefore, pregnant women who were at least nineteen weeks gestation were recruited.

Recruits needed to be fluent in the English language. Exercise directions were given in English; lack of fluency could cause safety concerns. In addition, the informed consent process and completion of the research instruments required comprehension of English.

Virginia Commonwealth University (VCU) Recreational Center has an established policy that limits access of their facility to minors (under 18). Pregnant women enrolled in the experimental group had to meet additional criteria. The VCU Recreational Center policies required pregnant women to have health care provider permission prior to participating in the aquatic study. The participants needed to be at least five feet tall since the pool is four feet at its shallowest point. Participants less than five feet tall would not have been able to touch the pool bottom safely. This would have impeded their ability to safely perform the aquatic exercises.

Exclusion Criteria

Biophysical safety parameters for pregnant women who exercise have been established by the American College of Obstetricians and Gynecologist and the American College of Sports Medicine. Participants with medical complications such as: multiple pregnancy, history of preterm birth, placenta previa and/or pregnancy induced hypertension were excluded from the study. These individuals were also excluded from

being members of the control group, as the stress of medical complications might have influenced their attitudes on variables being measured.

Recruitment/Retention

Subjects were recruited from the Richmond metropolitan area. Prior to initiating the study, local health care providers (HCP) were contacted by the investigator so that the intervention program could be explained. Posters and brochures, with inquiry and medical release forms attached, were placed in participating physicians' offices and health departments.

Each location had a registration box for interested potential participants. Boxes were checked by the investigator twice a week and phone contact was made with interested parties. The posters, letters and brochures contained study information, with inclusion criteria provided (see recruitment brochure Appendix A).

Intervention

The aquatic exercise program was a six-week program, with three sessions per week. Each class lasted 60 minutes. Virginia Commonwealth University Recreation Center pool was the site of the exercise program. To prevent investigator/participant interaction bias, the exercise program was not taught by the investigator. Instead, the program was taught by an experienced obstetric nurse and two VCU School of Nursing graduate students enrolled in the Women's Health Nurse Practitioner Program. The investigator, a certified prenatal aquatic instructor who developed the exercises, trained the instructors in the aquatic exercises to be included in the intervention program.

The first ten minutes of the class entailed warm up exercises and stretches. The water temperature ranged between 82 to 84 degrees. Warm up exercises help to raise the body temperature by increasing blood circulation. Muscles that are warmed up before stretching decrease the potential of muscle cramps or injury. A description of the exercise program, exercises and muscles involved is provided in Appendix B.

The continual movement phase lasted 25 to 30 minutes. During this portion of the classes, exercises designed to work the large muscles of the body, such as the legs and buttocks, were used.

Pregnant women who participate in exercise need to be instructed how to monitor their exercise intensity level. As a measure of intensity, fitness instructors frequently monitor participants' ability to engage in conversation during an exercise. People who are unable to carry on a conversation during exercise are exceeding a safe intensity level. A more effective measure is the Perceived Level of Exertion Scale developed by a physiologist Gunnar Borg. This scale represents an individual's perception of exercise intensity and energy expenditure (Borg, 1982). Research has shown a correlation between an exerciser's perceived level of exertion and blood lactate levels. Pregnant women's safe intensity range is between 12 to 16 on the 6 to 20 range scale. The Perceived Level of Exertion Scale was explained by the fitness instructors before each class. A large poster exhibiting the Perceived Level of Exertion Scale was prominently placed at poolside for participants' intensity evaluation.

The third phase of the exercise class was designed to strengthen the abdominal muscles, stretch the muscles of the lower portion of the back, and promote flexibility.

Ten to 15 minutes were devoted to these muscle groups. After this, a warm down, stretch out and relaxation session concluded the class. A copy of the exercise brochure is provided in Appendix C.

Participants wore swimsuit, jogging bra and running shorts, or T- shirt with a good support bra. The recreation center has a women's locker room adjacent to the pool so participants were able to change into swimwear. Likewise, rest rooms and a water cooler were with in 10 feet of the exercise area.

Research Instruments

Pender's Health Promotion Model (1996) served as the Conceptual-Theoretical-Empirical framework for this study (see Figure 1, Chapter 1). The empirical components under study, as shown in Figure 4, were: biological, sociocultural, psychological individual characteristics; self-efficacy; barriers to action, health-promoting behavior; discomfort; and mobility. The demographic data collected from the participants provided the biological and sociocultural data. The Pregnancy Body Shape Questionnaire was used to measure the psychological individual characteristic of body image. Two instruments, Perceived Health Competence Scale and Barriers to Health Promoting Behavior Scale, were administered to evaluate the participants' levels of perceived self-efficacy and perceived barriers to action. The Health-Promoting Lifestyle Profile was used to evaluate the effects of the intervention on participant's health promoting behavior. As an additional measure of health promoting behavior, commitment to the program, participants logged their attendance information at each exercise session. The health outcomes of mobility and discomfort were evaluated using the Timed Get Up and Go

Test and the Smith's Pregnancy Discomfort Intensity Index. Respectively, all tools are included in Appendix D.

Biological, Sociocultural, Psychological Individual Characteristics

Demographic data including age, gestational age of the fetus, gravidity, were collected (see Appendix D). This provided information about the biological characteristics of the sample. Socioeconomic status, educational level, marital status, previous exercise participation and ethnic origin data were used to determine homogeneity of the groups from a sociocultural perspective. Participants' body mass index (BMI) was calculated using their height and pretest/post-test weights. These data were used to determine the homogeneity of the groups.

The Pregnancy Body Shape Questionnaire (PBSQ) was used to measure participants' body image attitude as a measure of psychological characteristics. The PBSQ is a 34 item summated, six-point Likert scale adapted from the original Body Shape Questionnaire developed by Cooper, Taylor, Cooper and Fairburn (1987) to measure body image concerns. Higher summated scores indicate a negative body image attitude. The scale authors report the scale has a reliability of 0.87. Fox and Yamaguchi (1997) revised the original scale to measure body image during pregnancy. These researchers changed two of the questions to be specific to pregnancy issues. Original question number 12 read "have you noticed the shape of other (pregnant) women and felt that your own shape compared unfavorably?" Question 25 originally stated "have you felt that it is not fair that other (pregnant) women are thinner than you?" E-mail correspondence with

these authors reported a reliability of 0.86. on the revised scale. Overweight women had a mean PBSQ score of 74.94 and normal weight women mean score was 62.95.

Behavior Specific Cognitions and Affect

Self-Efficacy was measured using the Perceived Health Competence Scale (PHCS) and the Barriers to Health Promoting Behaviors Scale (BHPBS). The PHCS is an eight-item summated Likert scale developed by Smith, Wallston, and Smith (1995) to measure the degree individuals feel they are capable of managing their health outcomes. The lower an individual's score the higher his or her level of self-efficacy. One's sense of self-competence/self-efficacy is the perception of control over one's behavior and ability to achieve a goal. Smith et al. (1995) report a high level of internal consistency (0.87-0.9) and good test retest/reliability. The authors validated the internal consistency and stability of the instrument by administering it across various populations.

The BHPBS is an 18-item summated Likert style scale developed to measure barriers that impede individual's participation in healthy activities, such as exercise (Becker et al. 1991). The developers of the instrument report a reliability of 0.87. The higher a person's score, the less likely he or she will participate in exercise. It has been used in other studies involving research concerning levels of health promotion (Stuifbergen & Becker, 1994; Stuifbergen, Becker, Rogers, Timmermann, & Kullberg 1999).

Behavioral Outcomes

Health promoting behaviors were measured using the Health-Promoting Lifestyle Profile (HPLP) and the Aquatic Exercise Attendance Record. The HPLP, developed by Walker et al. (1987) is a 52-item summated scale which contains six subscales designed

to measure health responsibility, physical activity, nutrition, spiritual growth, interpersonal relationships, and stress management. The scale reliabilities range from 0.79 to 0.87 with an overall reliability of 0.94. The higher an individual scores on the profile the more he or she participates in health promoting activities. This instrument has been administered in research studies involving pregnant women (Teleen, 1993). In a pilot study of effects of exercise on maternal discomfort and health promoting behaviors, the HPLP was administered to 16 pregnant women. Subscale reliabilities ranged from 0.71 to 0.85 with an overall reliability of 0.94.

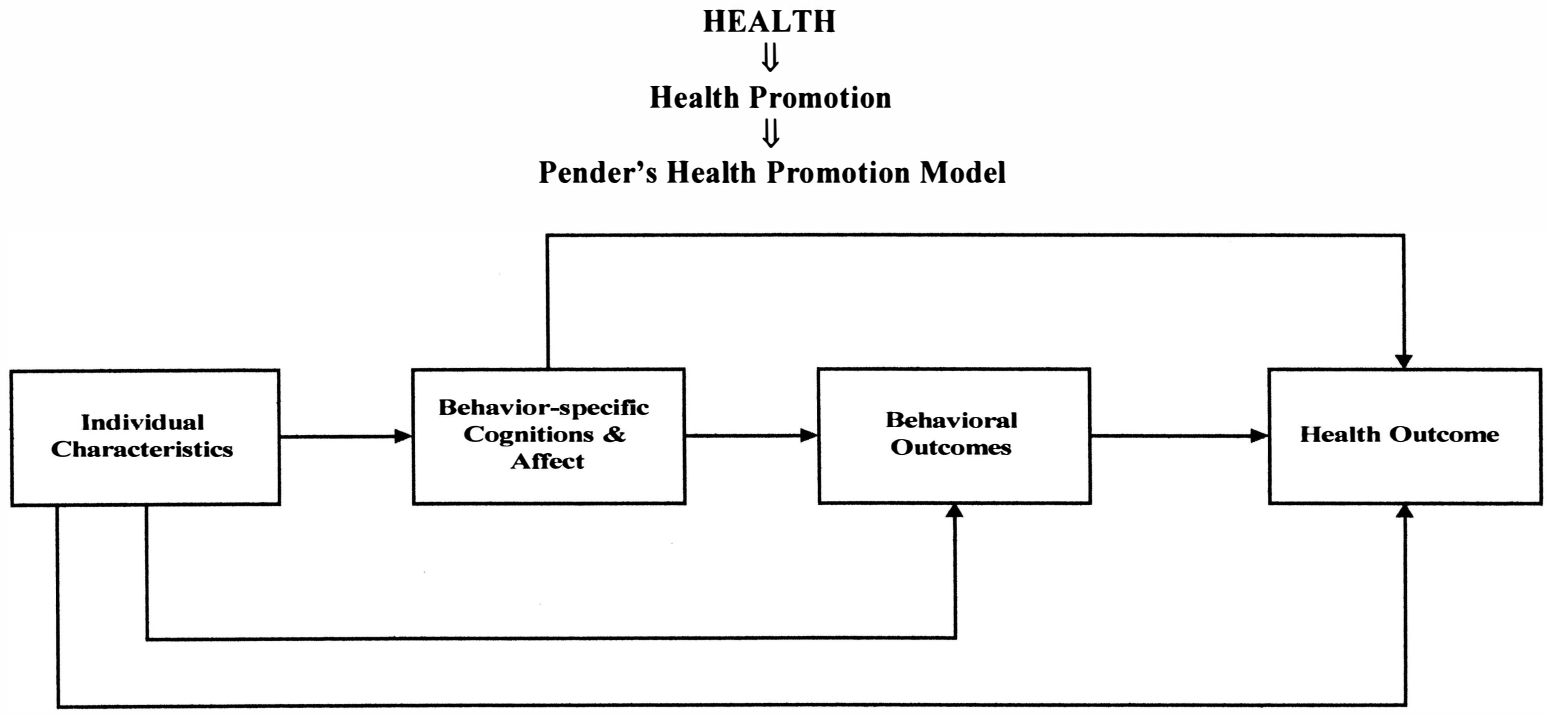
Health Outcomes

Health outcomes of mobility and discomfort were measured using the Timed Get Up and Go Test and the Smith Pregnancy Discomfort Intensity Index. The Timed Get Up and Go Test was developed by Podsiadlo and Richardson (1991) to measure geriatric participant's mobility. Physical mobility and balance are closely related to a person's ability to maintain functional status for performance of the activities of daily living and safety (Podsiadlo & Richardson, 1991). Prior to completing the test, a demonstration and starting procedure was discussed with each participant. Each participant was asked to sit in a standard chair without arms (approximately 46 cm seat height); on the verbal command "GO", the participant was asked to stand up and walk three meters (a red line was marked on the floor), turn, walk back to the chair, and sit down again. The test was timed with a digital watch to prevent timing errors. The rationale for selecting this measure included a reported reliability of 0.96, and a rapidity of administration. This test

was administered to pregnant participants enrolled in the pilot study. Scores on the pilot data were placed in an SPSS file and the reliability was computed 0.92.

The Smith Pregnancy Discomfort Intensity Index was developed by the investigator. This three-item Likert style index was used to measure the various levels of pregnancy discomforts. Back pain, leg cramps, and edema are the three most common discomforts of pregnancy reported by health care providers and in the literature (Koniak-Griffin, 1994; Clapp, 1998). In a pilot study of this exercise program, when Likert and visual analog scales were administered, participants indicated a preference for the Likert-style scale. Additionally, this scale was administered to nurses in a local hospital. Patients who were representative of the potential sample, were asked their preference between the visual analog versus Likert style scales. These patients chose the word description over marking on the line because it was "easier for them to use." Reliability data was also higher for the Likert scale at 0.89. The higher the score, the greater the intensity of the participants' discomfort.

Figure 4. Conceptual Theoretical Empirical Framework with Measures



Biological *	Self-Efficacy	Health-Promoting Behaviors	Mobility
Sociocultural ∇	Barriers to Action	Commitment to Plan of Action	Discomfort
Psychological ψ			
* Gravidity	PHCS	Attendance Record	Smith Pregnancy Discomfort Intensity Index
* Gestational Age	BHPBS	HPLP	Timed Get Up & Go
∇ Demographics			
ψ PBSQ			

Procedures

Control group testing was scheduled two days prior to the start of the exercise program. The testing took place at the VCU School of Nursing. Participants' height and weight was measured on a digital calibrated balance scale in order to compute their Body Mass Index. Measurements were taken in a screened area to insure participant privacy. Each of the participants completed the pretest research instruments: demographic data, Smith Pregnancy Discomfort Intensity Index, PBSQ, HPLP, PHCS, BHPBS, and Timed Get Up and Go Test.

Before completing the mobility assessment, a demonstration and starting procedure was described by the test administrator and discussed with each participant. The test administrator was not aware of participant's group assignment.

The completion of the written scales required approximately 25 minutes, which was similar to the administration time of the pilot study sample. The mobility assessment took less than five minutes. Prior to leaving the testing area participants were given instructions concerning post-test time and the reward program. Post-tests were held six weeks later at the same location. The experimental group testing also took place at the VCU School of Nursing two days before the exercise program started. Testing was the same as the control group.

Prior to the first exercise session, the prenatal aquatic instructor gave a demonstration of the prenatal aquatic exercises that were designed to strengthen abdominal muscles and improve posture and flexibility. These exercises were designed by the investigator of the study and approved by the Virginia Commonwealth University School of Allied Health

Professions, Department of Physical Therapy. Participants were also familiarized with the safety guidelines, the perceived level of exertion scale and lastly, the sign-in procedure for the aquatic exercise attendance record. Post-tests were administered six weeks later.

Data Analysis Plan

Data were entered into a SPSS file. Descriptive statistics were computed on the demographic data. In order to determine similarities or differences between the groups at the pretest phase, independent t tests were computed on the PBSQ, HPLP, PHCS, Barriers to Health Promoting Behaviors, Timed Get Up and Go Test, Smith Discomfort Intensity Index, body mass index, and demographic data.

In studies that are unable to control for extraneous variables by using random assignment to group, analysis of covariance (ANCOVA) is the appropriate parametric measure (Brown, 1999). ANCOVA combines ANOVA with multiple regression to control the effect of one or more extraneous variables on the dependent variable. This statistical procedure is designed to compare two or more groups after statistically controlling for extraneous variables that were identified as covariates. The discomfort and mobility pretest scores were entered into the ANCOVA equation as covariates on all hypothesis tests.

Validity

According to Cook and Campbell (1979), types of validity include: construct, statistical conclusion, internal and external validity. In addition, potential threats to validity include history, maturation, testing, and mortality (attrition). Each of the types of validity and threats to validity are discussed in more detail below.

Construct validity refers to the degree in which the instruments involved in a study measure the concept or construct under investigation. For example, the HPLP was developed specifically to measure health promotion. It has been used in previous research studies involving health promotion, exercise, and pregnancy issues. The PBSQ was revised by Fox and Yamaguchi (1997) to determine its applicability for measuring pregnant women's body image concerns. The Timed Get Up and Go mobility assessment was administered to measure mobility problems related to pregnancy during the pilot phase to determine its suitability. In addition, the Smith Discomfort Intensity Index was used in the pilot work with pregnant women who were experiencing the discomforts of pregnancy.

Statistical conclusion validity is the degree to which the conclusions reached are accurate and credible. In previous research, the Perceived Health Competence Scale yielded good internal consistency levels: 0.87 to 0.90. In this study, however, the PHCS, as it was originally constructed, did not yield an adequate alpha reliability.

A decision was made by the investigator to defer to patient safety rather than statistical power in determining sample size. A post-hoc power analysis was computed on the data to determine the effects of using a smaller sample. This power analysis revealed the study had 1.0 observed power.

Internal validity describes how a study is designed so that the experimental treatment, and only that treatment, is responsible for the outcome. Internal validity is usually discussed in terms of what events during a study could produce invalid results. These events include history, maturation, testing, and mortality.

Threats to Validity

History refers to some external event that may, between the pretest and post-test data collection points, become the cause of subjects' responses at post-test. During the six-week period, subjects enrolled in this study were seen by their health care providers, and they may have received advice regarding a pregnancy discomfort. This cannot be avoided, but must be acknowledged as a potential threat to validity.

Maturation refers to people growing and changing during the six-week period. Since all the participants were in the same phase of their pregnancy, the maturation effects of weight gain and abdominal size would be comparable. At 26-39 weeks the pregnant women's discomforts and level of immobility were anticipated to be higher.

Testing is the effect of one test on the results of a second test. In other words, will subjects change as a result of being tested or does the intervention cause the change? In this study, women in both groups had the potential to seek healthier lifestyles, knowing they would be retested. As far as mobility and discomfort testing, the physiological changes related to pregnancy were expected to increase pregnant women's level of discomfort at post-test. It was hypothesized that the exercise group discomfort level would be less than the non-exercise control group.

Mortality refers to attrition rate. It was hoped that the reward system would keep people interested in participation. Transportation bus tickets or parking passes were given to assist participant's attendance. A phone call and a reminder letter were sent to all participants reiterating the rewards program at post-test. Additionally, it was anticipated that the ongoing benefits of the aquatic exercise would lessen dropouts in the

experimental group. During the pilot study, there were no dropouts; attendance at the exercise class was 90%. Additionally, there was always a possibility of attrition related to medical complications. In the present study, the average attendance by the exercise group was two times per week. All of the exercise group participants completed the post-test phase. One of the non-exercisers had to withdraw from the study due to medical complications leading to preterm delivery.

External validity, or generalizability, addresses whether the results can be applied to the general population. The aquatic environment and strict inclusion criteria limits the generalizability of this study to other settings and samples, but not to other healthy pregnant women.

Limitations

As the literature review revealed, there are no other published studies that evaluate the effects of aquatic exercise on pregnant body image, discomfort and mobility. Thus, comparing the results of this study to other related studies is limited. Secondly, pregnant women who were afraid of water may have been reluctant to participate in an aquatic exercise intervention program. Moreover, this study entailed a large time commitment on the part of the exercise participants.

Protection of Human Subjects

This study received approval from the Institutional Review Board of Virginia Commonwealth University. Pregnant women recruited to participate in the proposed research study were informed of the purpose of the study. Participants self-selected to be members of the exercise or non-exercise groups. The informed consent document

addressed the topics of absence of personal benefits and risks, alternative therapy, and costs of participation. Additionally, methods to protect participant anonymity and confidentiality of research were explained. A copy of the informed consent form is provided in Appendix E.

CHAPTER 4

Results

The purpose of this study was to determine the impact of an aquatic exercise intervention program on pregnant women's body image, perceived self-efficacy, health-promoting behaviors during pregnancy, mobility, and discomforts. The findings relative to the following six research hypotheses are reported in this chapter.

Hypotheses

Six hypotheses were tested.

H_1: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have an improved level of body image as compared to pregnant women who do not participate in the aquatic exercise program as measured by the Pregnant Body Shape Questionnaire (PBSQ).

H_2: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a higher level of self-efficacy than pregnant women who do not participate in the aquatic exercise program as measured by the Perceived Health Competence Scale (PHCS).

H_3: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a lower level of barriers to health promoting behaviors than pregnant women who do not participate in the aquatic exercise program as measured by the Barriers to Health Promoting Behaviors Scale (BHPBS).

H_4: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have improved health promoting behaviors as compared to the pregnant women who do not participate in the aquatic exercise program as measured by the Health-Promoting Lifestyle Profile (HPLP).

H_5: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have less discomfort than pregnant woman who do not participate in the aquatic exercise program as measured by the Smith Pregnancy Discomfort Intensity Index.

H_6: Following completion of a six-week aquatic exercise program, pregnant women participating in an aquatic exercise program will have improved their mobility more than pregnant women who do not participate in the aquatic exercise program as measured by the and the Timed Get Up and Go Test.

The design of this study was a pretest/post-test experiment with a six-week interval between time one and time two data collection points. After the participants completed all the questionnaires and mobility assessments, data were entered into a SPSS data file. Frequency distributions and other descriptive statistics were calculated from the

compiled demographic information and research instruments. In order to determine similarities or differences between the groups at the pretest phase, independent t tests were completed for the Pregnancy Body Shape Questionnaire (PBSQ), Health-Promoting Lifestyle Profile (HPLP), Perceived Health Competence Scale (PHCS), Barriers to Health Promoting Behaviors (BHPB), Timed Get Up and Go Test, Smith Pregnancy Discomfort Intensity Index, and demographic data. Analysis of covariance (ANCOVA), which combines ANOVA with multiple regression to control the effect of one or more extraneous variables on the dependent variable, was computed on the data gathered using the research instruments. This statistical procedure is designed to compare two or more groups after statistically controlling for extraneous variables identified as covariates. The discomfort and mobility pretest scores were entered into the ANCOVA equation as covariates.

Sample Demographics

A convenience sample of 41 participants, 20 aquatic exercisers (experimental group) and 21 non-exercisers (control group) were recruited between October 24 and November 5, 2001. The Aquatic Exercise Association recommends that class size be limited to 20 exercise participants because of participant safety (Sova, 1991). A power analysis to determine sample size was performed using the discomfort and mobility scores obtained from pilot data. The power analysis revealed that 40 participants in each group (exercise and non-exercise) would have 83% power to detect a difference in means of 0.700 (the difference between a control group mean of 2.500 and an exercise group mean of 1.800) assuming that the common standard deviation is 1.05 using analysis of

covariance with baseline pregnancy discomfort index score serving as the covariate. With consideration given to both participant safety and statistical power, 20 participants were enrolled in the exercise and 21 in the non-exercise group. One of the non-exercisers withdrew from the study because of a medical complication leading to preterm delivery. Analyses were run on the remaining 40 participants.

A post-hoc power analysis was computed on the data to determine the effects of using a smaller sample. This power analysis revealed the study had 1.0 observed power. For further research, the sample size for a 0.9 power would be eight participants in each group.

Participants were recruited from the Richmond metropolitan area. Posters and brochures, with inquiry and medical release forms attached, were placed in participating physicians' offices, and health departments. During the recruitment phase, the researcher visited these sites frequently to check for potential participants and to be available to health care providers to ask questions concerning the research project. At the time of enrollment, the participants were given directions to the pretest site, the VCU School of Nursing. Pretest data for participants in both groups were collected two days before starting the exercise program. Most of the participants were able to complete the written questionnaires in 25 minutes and the mobility assessment took less than 5 minutes. Post-tests were scheduled for 6 weeks after the pretest for participants in both groups. Four of the participants were unable to come to the scheduled post-test session because of transportation issues. These participants completed their post-tests three days after the original post-test date.

Twenty-five of the participants attended a university based prenatal clinic, 11 of these were exercisers and 14 were non-exercisers. The remaining 15 participants, 9 exercisers and 6 non-exercisers, were recruited from private obstetrician offices. Twenty-three of the participants met the financial eligibility requirements for Medicaid funded health care. The sample was ethnically diverse: 15 were White, 24 were African-American and 1 was Asian. Ethnicity by group selection is presented in Table 1. The gestational age at pretest ranged from 18 weeks to 34 weeks with a mean gestational age of 26.93 weeks (SD = 4.83).

Participants ranged in age from 18 to 37 with a mean age of 25.2 (SD = 5.32). Only two of the 40 participants were actively engaged in a formal exercise program prior to their enrollment in this study. Obesity was an important characteristic of this sample The mean Body Mass Index of both groups, exercisers and non-exercisers, was greater than 30 meters squared. According to Morin, Brogan, and Flavin (2002), obesity is a deterrent to exercise participation during pregnancy. The sample was fairly well educated; 14.6 % had completed college, while 36.6 % had completed the twelfth grade. The lowest level of education completed was the tenth grade. The participant's gestational age at pretest ranged from 19 to 34 weeks. The demographic data are presented in Table 2.

Table 1.

Ethnicity by Group

Group	White	African-American	Asian	Total
Exercise	7	13	0	20
Non-exercise	8	11	1	20

Table 2.

Demographic Data by Group

Group	Age Mean(SD)	Education (Years of Schooling) Mean (SD)	Number of Pregnancies Mean (SD)	Gestational age Mean (SD)
Exercise	25.1 (4.87)	13.0 (2.1)	2 (1.5)	26.30 (5.2)
Non-exercise	25.29 (5.8)	12.7 (2.1)	1.9 (1.1)	27.55 (4.5)

The group demographic variables of age, ethnicity, educational level and gestational age were analyzed by independent sample t-test. There were no statistically significant differences between group means on these variables.

The prenatal exercisers (experimental group) signed in on the attendance record at each exercise session. The average participant attendance was twice a week. The class met Monday, Wednesday and Friday afternoons from 4:30pm to 5:30 pm. Friday sessions were the least attended.

Correlation Analysis

Of the main outcomes, only the measures for discomfort and mobility were significantly related; e.g. the higher the discomfort score, the higher the mobility impairment score; indicating a longer time needed to rise from the chair and walk ($r = 0.43$, $p = 0.005$). A number of the subscales on the HPLP were correlated at statistically significant levels with the main outcomes. The health responsibility subscale score was inversely related to the discomfort score. As scores on the discomfort index increased, the health responsibility score decreased ($r = -0.40$, $p = 0.01$). The stress management subscale scores were inversely related to the discomfort scores ($r = -0.67$, $p < 0.001$). The physical activity subscale score was inversely related to the discomfort scores, indicating that as discomfort increases there was less participation in physical activity ($r = -.49$, $p = 001$).

Hypothesis Testing

The results are presented in the order of the hypotheses. Hypotheses 1, 4, 5, and 6 were supported while Hypotheses 2 and 3 were rejected. A summary table, Table 3, provides the statistical results for all variables.

Table 3.

Post-test Results

Scale	Level of Significance
Pregnancy Body Shape Questionnaire	F = 3.441; p = 0.05
Perceived Health Competence Scale	F = 0.492; p = 0.48
Barriers to Health Promoting Behaviors	F = 28.58; p = 0.88
Health-Promoting Lifestyle Profile	F = 3.587; p = 0.05
Smith Pregnancy Discomfort Index	F = 33.07; p = 0.001
Timed Get Up and Go Test	F = 40.61; p = 0.001

Hypothesis 1

Hypothesis 1 was: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have an improved level of body image as compared to pregnant women who do not participate in the aquatic exercise. The Pregnant Body Shape Questionnaire (PBSQ) was used to measure participants' body image. Pretest assessment of the internal consistency of the PBSQ produced an alpha reliability of 0.96. In order to compare group differences at pretest, an independent sample t test was computed; there was no statistically significant difference between the groups at pretest ($t = 0.801$, $p = 0.768$). A higher summated score on the PBSQ indicates a negative body image attitude; the possible range of scores is 34 to 204. The results from this sample at post-test produced a range of scores from 35 to 142 with a mean of 58.68. Data were analyzed using an ANCOVA with pretest scores from the

Timed Get Up and Go Test and Smith Pregnancy Discomfort Intensity Index as covariates. There was a statistically significant difference between the two groups at the time of post-test ($F = 3.441$ $p = 0.05$). The hypothesis was accepted. The mean scores of each group at pretest and post-test are shown in Table 4.

Table 4.

Mean PBSQ Scores by Group

Group	Pretest Mean (SD)	Post-test Mean (SD)
Exercise	65.6 (23.61)	57.30 (24.07)
Non-Exercise	59.1 (27.53)	60.05 (24.35)

Hypothesis 2

Hypothesis 2 was: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a higher level of self-efficacy than pregnant women who do not participate in the aquatic exercise program as measured by the Perceived Health Competence Scale (PHCS). Although the alpha reliability of the PHSC has previously been reported at 0.87 to 0.90, the pretest assessment of internal consistency in this study produced an alpha coefficient of 0.54. When the negatively coded item questions were eliminated from the PHCS, reliability increased to 0.85. This adjusted alpha would reflect the approximate level of reliability reported by the developers of the scale. In order to compare group differences at pretest, an independent sample t test was computed on the PCHS. There was no statistically

significant difference between the groups at pretest ($t = 0.109$, $p = 0.996$). Higher scores on the PHCS indicate higher levels of self-efficacy. The possible range of scores was 8 to 40. The results from this sample at post-test produced a range of scores from 15 to 35. Data were analyzed using an ANCOVA with pretest scores from the Timed Get Up and Go Test and Smith Pregnancy Discomfort Intensity Index as covariates. There was no statistically significant difference between the two groups at the time of post-test ($F = 0.492$, $p = 0.488$). The hypothesis was rejected. The mean scores of each group at pretest and post-test are shown in Table 5.

Table 5.

Mean PHCS Scores by Group

Group	Pretest Mean (SD)	Post-test Mean (SD)
Exercise	28.45 (4.55)	27.90 (5.06)
Non Exercise	28.30 (4.13)	28.75 (4.42)

Hypothesis 3

Hypothesis 3 was: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a lower level of barriers to health promoting behaviors than pregnant women who do not participate in the aquatic exercise program as measured by Barriers to Health Promoting Behaviors Scale. The pretest assessment of the internal consistency of this barriers scale produced an alpha coefficient of 0.80. An independent sample t test computed on pretest data

indicated there was no statistically significant difference between the groups ($t = 0.811$, $p = 0.177$). Higher scores on the Barriers to Health Promoting Behaviors Scale indicate that the individual has more barriers to participation in exercise. Lower scores indicate fewer barriers to participation in healthy activities. The possible range of scores on this scale was 18 to 72. The results from the sample at post-test produced a range of 18 to 43. Data were analyzed using an ANCOVA with pretest scores from the Timed Get Up and Go Test and Smith Pregnancy Discomfort Intensity Index as covariates. There was no statistically significant difference between the two groups at the time of post-test ($F= 0.021$, $p = 0.885$). The hypothesis was rejected. The mean scores of each group at pretest and post-test are shown in Table 6.

Table 6.

Mean BHPBS Scores by Group

Group	Pretest Mean (SD)	Post-test Mean (SD)
Exercise	29.55 (4.85)	29.55 (4.85)
Non-Exercise	27.86 (8.03)	27.86 (8.03)

Hypothesis 4

Hypothesis 4 was: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have improved health promoting behaviors as compared to the pregnant women who do not participate in the aquatic exercise program as measured by the Health Promotion Lifestyle Profile

(HPLP). Pretest assessment of the internal consistency of the HPLP produced the following alpha coefficients: total index 0.95; health responsibility subscale 0.83; physical activity subscale 0.80; nutrition subscale 0.79; spiritual growth subscale 0.82; interpersonal relationships subscale 0.87; and stress management subscale 0.83. Independent sample t tests computed on the pretest data revealed no statistically significant difference between the groups on any subscale or total scale (total scale $t = 0.669$, $p = 0.113$; health responsibility $t = 0.627$, $p = 0.535$; physical activity $t = 0.033$, $p = 0.974$; nutrition $t = 0.097$, $p = 0.923$; spiritual growth $t = 0.952$, $p = 0.347$; interpersonal responsibility $t = 1.477$, $p = 0.148$; stress $t = 1.544$, $p = 0.131$). Higher scores on the profile indicate greater participation in health promoting activities. The potential range of scores on the total scale was 52 to 208.The results from this sample produced a range of 73 to 201. Data were analyzed using an ANCOVA with pretest scores from the Timed Get Up and Go Test and Smith Pregnancy Discomfort Intensity Index as covariates. There were statistically significant differences between the groups on the overall scale ($F = 3.587$, $p = 0.05$) and the following subscales: health responsibility ($F = 4.375$, $p = 0.04$); physical activity ($F = 8.490$, $p = 0.006$); and stress management ($F = 28.58$, $p < 0.001$). There were no statistically significant differences between the groups on the following subscales: nutrition ($F = 0.212$, $p = 0.65$); spiritual growth ($F = 0.358$, $p = 0.54$); and interpersonal relationships ($F = 0.080$, $p = 0.94$). The hypothesis was accepted. The mean scores of each group at pretest and post-test for each subscale and the total scale are shown in Table 7.

Table 7.

Mean HPLP Scores by Group

	Exercise Pretest Mean (SD)	Exercise Post-test Mean (SD)	Non-exercise Pretest Mean (SD)	Non-exercise Post-test Mean (SD)
HPLP Total Score	135.25 (21.33)	149.45 (23.82)	140.35 (26.61)	131.30 (26.65)
Health Responsibility	24.05 (5.04)	26.1 (4.47)	23.0 (5.54)	22.3 (5.50)
Physical Activity	16.55 (3.81)	18.35 (4.19)	16.5 (5.71)	14.85 (3.53)
Nutrition	23.8 (4.59)	23.6 (5.69)	23.95 (5.19)	22.65 (5.36)
Spiritual Growth	26.55 (4.8)	27.05 (4.75)	27.95 (4.89)	28.10 (6.01)
Interpersonal Relationship	26.15 (5.89)	27.75 (6.44)	28.65 (5.21)	26.85 (6.36)
Stress Management	18.1 (3.7)	24.05 (3.95)	20.3 (5.0)	17.05 (4.09)

Hypothesis 5

Hypothesis 5 was: Following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have less discomfort than pregnant women who do not participate in the aquatic exercise program as measured by the Smith Pregnancy Discomfort Intensity Index. Pretest assessment of the internal

consistency of the Smith Pregnancy Discomfort Intensity Index produced an alpha coefficient of 0.85. In order to compare group differences at pretest, an independent sample t test was computed. There was no statistically significant difference between the groups at pretest ($t = 0.24$, $p = 0.772$). A higher score on the Smith Pregnancy Discomfort Intensity Index indicates a more intense level of discomfort. The results from this sample at post-test produced a range of scores from 0 to 10. Data were analyzed using an ANCOVA with pretest scores from the Timed Get Up and Go Test and Smith Pregnancy Discomfort Intensity Index as covariates. In this study, the exercise group reported statistically significant lower levels of back pain ($F = 6.580$, $p = 0.015$); leg cramps ($F = 9.471$, $p = 0.004$); and edema ($F = 12.661$, $p = 0.001$). There was a statistically significant difference between the two groups at post-test ($F = 33.07$, $p < 0.001$). The mean scores on the Smith Discomfort Intensity Index pretest and post-test are shown in Table 8.

Table 8.

Mean Smith Pregnancy Discomfort Intensity Index Scores by Group

Group	Pretest Mean (SD)	Post-test Mean (SD)
Exercise	3.55 (1.9)	2.75 (1.33)
Non-exercise	2.8 (1.9)	4.9 (1.41)

Hypothesis 6

Hypothesis 6 was: Following completion of a six-week aquatic exercise program, pregnant women participating in an aquatic exercise program will have improved their mobility level more than pregnant women who do not participate in the aquatic exercise

program as measured by the Timed Get Up and Go Test. Pretest assessment of internal consistency of the Timed Get Up and Go Test produced an alpha coefficient 0.90. In order to compare group differences at pretest, an independent sample t test was computed. There was no statistically significant difference between the groups at pretest ($t = 4.88$, $p = 0.769$). The results from this sample at post-test produced a range of times 11.34 to 29.43 seconds. There was a statistically significant difference between the groups at post-test ($F = 40.61$, $p < 0.001$). The mean scores of each group at pretest and post-test are shown in Table 9.

Table 9.

Mean Timed Get Up and Go Test Scores by Group

Group	Pretest Mean (SD)	Post-test Mean (SD)
Exerciser	17.71 (3.14)	18.02 (4.56)
Non-exerciser	17.18 (3.77)	22.93 (3.98)

Summary

The effect of participating in an aquatic exercise program on maternal body image, health promoting behaviors, maternal discomfort and mobility was measured by quantitative approaches of descriptive statistics, independent sample t test, and analysis of covariance. Data were calculated from this sample using the research instruments Pregnant Body Shape Questionnaire (PBSQ), Perceived Health Competence Scale (PHCS), Barriers to Health Promoting Behaviors (BHPBS), Health Promotion Lifestyle Profile (HPLP), Smith Discomfort Intensity Index, and the Timed Get Up and Go Test.

All instruments had adequate reliability with the exception of the Perceived Health Competence Scale.

In order to compare group differences at the pretest phase, independent sample t tests were computed on all the pretest data; there were no statistically significant differences between the groups at pretest on any measure. The aquatic exercise intervention program was found to have a significant impact on pregnant women's body image, health promoting behaviors, maternal discomfort and mobility. The intervention program was not found to a have a significant impact on pregnant women's self-efficacy (perceived health competence) or perception of barriers.

CHAPTER 5

Conclusions

The purpose of the current study was to identify and explicate the effects of an aquatic exercise intervention program on women's body image, health-promoting behaviors, mobility, and discomforts during pregnancy. This chapter opens with a discussion of the findings and then identifies their implications for nursing practice. The implications are further elucidated in the conclusion, which closes with recommendations for future research in the health promotion field.

Sample Demographics

The research sample differed from samples includeed in other studies on exercise during pregnancy. Up until now, the majority of women who participated in pregnancy and exercise research investigations were physically fit, white primigravidas from well-educated, upper-class populations (Lokey et al., 1991; Clapp & Little, 1995).

In this study, a convenience sample of 40 participants, 20 aquatic exercisers, 20 non-exercisers, were recruited between October 24 and November 5, 2001. The sample was ethnically diverse: 58.5% were African-American, 39 % Caucasian, and 2% Asian. Several factors could explain the ethnic diversity. In addition to placing recruitment brochures in visible locations throughout the Richmond area, nursing staff put brochures

in potential participants' patient education materials. Also, a positive relationship existed between the investigator and health-care providers who assisted in the recruitment process. Moreover, the sample who attended both private and university-based obstetrical practices in Richmond was primarily African-American. Finally, the pretest and post-test location was in the heart of the city, in close proximity to parking facilities and bus transportation.

Another important sample characteristic was obesity, which other researchers cited as a deterring factor in exercise participation during pregnancy, especially for African-American women (Morin et al., 2002). In addition, the sample was comprised largely of urban participants, half of whom were at lower socioeconomic levels. Of the 40 participants, 26 met the financial eligibility requirements for Medicaid funded health care. Finally, the sample was fairly well educated. Participants had a range of educational levels: 14.6 % had some form of college education; 36.6 % had completed the twelfth grade; the lowest level of education completed was tenth grade.

In summary, the characteristics distinguishing this sample from those of other research studies about exercise during pregnancy were ethnic diversity, obesity, lower socioeconomic status, and educational heterogeneity. Unlike the previous pregnancy and exercise research investigations that had restricted samples of physically fit, white, well educated, and affluent participants, the exercise intervention program studied here included obese, minority, and lower socioeconomic status participants. In brief, this research study consisted of a more heterogeneous sample, compared with other research studies about exercise during pregnancy that used more homogeneous samples.

Body Image

Hypothesis 1, following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will experience an improved level of body image as compared to pregnant women who do not participate in such a program as measured by the Pregnant Body Shape Questionnaire, was accepted.

The literature reports that pregnant women are adversely affected by the psychological stress that is caused by their body image. More than 50% of pregnant women express dissatisfaction with their body image (Hofmeyer et al., 1990; Walker, 1998). At the time of pretest during this study, 75% of the sample could be categorized as obese based on their body mass index, but lower levels of negative body image were reported. This finding suggests that the psychological stressor of body image during pregnancy was not a great concern to these women. However, even though the magnitude of pregnant body image appeared to be of less concern for this sample than that reported in previous research, the study findings suggest that pregnant women who participate in an exercise program are more likely to have an improved body image.

The ethnic diversity of the sample may explain why pregnant body image concerns do not reflect what has been previously reported in the literature (Hofmeyer et al., 1990; Walker, 1998). Recently, Morin and colleagues (2002) conducted a descriptive study with pregnant African-American women to find out how they felt about their bodily changes. When comparing their findings to earlier research with samples of white pregnant women, Morin et al. observed differences in body image perceptions between white and African-American populations. They found that African-American women

tended to have a more positive body image irrespective of their body size. This observation is consistent with other fairly recent pregnancy-related research. Although African-American women are prone to be larger, as measured by the body mass index, their size and pregnancy-related changes seem to be less of a problem (Baturka, Hornsby, Schorling, 2000; Neff, Sargent, McKeown, Jackson, & Valois, 1997). In addition, Fox and Yamaguchi (1997) reported that obese women, in general, feel less stigmatized by their size when they are pregnant. Finally, Koniak-Griffen (1994) concluded that pregnant women who participated in aerobic exercise programs reported a more positive self-concept.

Self-efficacy

Hypothesis 2, following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a higher level of self-efficacy than pregnant women who do not participate in the aquatic exercise program as measured by the Perceived Health Competence Scale (PHCS), was rejected.

Self-efficacy was measured using the Perceived Health Competence Scale (PHCS), a measure of the degree individuals feel they are capable of managing their health outcomes. In previous research, this scale yielded good internal consistency levels ranging from 0.87 to 0.90. In this study, however, the PHCS, as it was originally constructed, did not yield an adequate alpha reliability. It is possible that the language in the questionnaire may have confused the participants. The PCHS includes three negatively worded questions. When these questions were statistically eliminated from the

PHCS, the reliability coefficient increased to 0.85. This adjusted alpha would reflect the approximate level of reliability reported by the developers of the scale.

An analysis of this discrepancy in reliability showed a relationship between the participants' item response pattern and their educational level. Participants with less than 14 years of schooling tended to answer the negatively coded questions with either 1 (strongly agree), or 2 (agree). Since the majority of questions were worded in an affirmative way and insinuated a need for positive response, the less educated participants might have thought this response pattern as the right approach for all questions. A plausible explanation is, that negatively worded items may have confused less sophisticated participants (DeVellis, 1991).

Participants' scores on the PCHS indicated the mid-level range which according the scale is "uncertainty level". Participants were uncertain about their competence to manage their health outcomes. Moreover, even when the test of differences between groups was recomputed after eliminating the negatively worded items, there was still no statistically significant difference between the groups.

Because the intervention program was only six weeks in length, there may not have been enough time between pretest to post-test to produce a cognitive change. In support of this possibility, Schwarzer (1995) reported time a delay factor between perception of self-efficacy and acknowledgement of consequences of benefit of an action.

Barriers to Health-promoting Behaviors

Hypothesis 3, following completion of a six-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have a lower level

of barriers to health-promoting behaviors than pregnant women who do not participate in the aquatic exercise program as measured by Barriers to Health-promoting Behaviors Scale (BHPBS), was rejected.

The fact that the individuals enrolled in this study, exercisers and non-exercisers, scored in the low range on the BHPBS means that they did not perceive difficulties in participating in health-promoting behaviors, such as seeking prenatal care or financial assistance. While the BHPBS has a possible range of scores from 18 to 72, the mean of this sample was in the low range, 28.68, and was consistent with study findings reported in the literature. Previous research studies indicated that pregnancy could be a motivator to seek and participate in healthy activities (Low, 1993; Rubin, 1976; and Tellen, 1993).

Although the participants did not report barrier problems, the participants discussed transportation difficulties and financial complexity involved in participation in health-promoting behaviors. The majority of this sample was from the lower socioeconomic sector. This population may be acculturated to what scale developer's perceived as barriers to health-promoting behaviors, such as lack of transportation or convenient facilities. The scale did not capture these problems. Moreover, this instrument has been used mostly with middle to upper socioeconomic samples and has not previously been used with pregnancy research. The precision of scale may have been the problem. Future research on the barriers to participation in health-promoting behaviors using a qualitative method may help identify and evaluate the barriers experienced by pregnant women. Identification of perceived barriers will help with planning future interventions.

Health-Promoting Behaviors

Hypothesis 4, following completion of a six-week exercise aquatic exercise program, pregnant women who participate in an aquatic exercise program will have improved health-promoting behaviors as compared to pregnant women who do not participate in the aquatic exercise program as measured by the Health Promoting Lifestyle Profile (HPLP), was accepted.

Higher scores on the HPLP are associated with participation in health-promoting activities. The sample's mean score of the HPLP was 139.2, indicting that the participants "often" participated in health-promoting behaviors. Moreover, participants in the exercise group had statistically significantly higher post-test scores than those in the non-exercise group.

The HPLP contains six subscales as previously described. Although there were no differences between the groups at pretest, there were statistically significant differences at post-test on the health responsibility, physical activity, and stress management subscales. These study findings are supported by other exercise intervention studies. For example, Bottorff, Johnson, Ratner, and Hayduk (1996) conclude that people who are involved in exercise take more responsibility for their health. Likewise, Lannon (1997) reports that individuals involved in health-promoting intervention take more proactive measures in managing their health. Additionally, participation in group activity may have motivated participants to perform more health responsibility activites.

In this study, the exercise group participated in a prenatal aquatic exercise program designed to reduce maternal discomforts and to improve mobility. Eighteen

classes were held at the Virginia Commonwealth Recreation Center. Attendance frequency ranged from 10 to 17 classes with a mean of 13 classes. Only two people were members of a recreation center. It would be a logical conclusion that people attending an exercise program reported an increased level of physical activity. In fact, this study confirmed that assumption: there was a statistically significant difference between the two groups at the time of post-test on the physical activity scale.

Because more than half of the participants (26 out of 40) in this research study were eligible for Medicaid-funded health care due to their lower income, the relationship between income and participation in health-promoting behavior was an additional issue of relevance to this study. Those in the exercise group who were financially stressed had a statistically significantly higher score on the health responsibility scale.

The present study findings are, however, in contrast to those reported by Kemp and Hatmaker (1993). Their sample was comprised of 43 African-American and 22 Caucasian pregnant women whose annual income was lower than $15,000 and who attended a university-based prenatal clinic. These women, according to Kemp and Hatmaker, participated in fewer health responsibility behaviors, such as regularly keeping their prenatal appointments.

As mentioned above, the majority of participants in this study were financially stressed as evidenced by their eligibility for federal financial assistance. Psychological benefits of exercise that have been reported include reduced depression, anger, perceived stress, and anxiety as well as increased perceived health and fitness (Hassemen, Koivula, and Uutela, (2000). Carmack, Boudreaux, Amaral-Melendez, Brantley, and Moor (1999)

all found a correlation between some form of aerobic exercise and lower levels of stress in their survey studies. Lox and Treasure (2000) conducted a study of 41 middle- and upper-income, mostly Caucasian pregnant women to observe the effects of aquatic exercise participation on feeling states. All 41 subjects participated in prenatal aquatic exercise classes scheduled semi-weekly for six weeks, each session lasting 45 minutes. The authors asserted that the participants reported less psychological distress at the completion of the aquatic exercise program, as well as after single sessions of aquatic exercise.

No differences were noted on the nutrition, interpersonal relationships and spiritual growth subscales of the HPLP. Health promotion is the basis for prenatal care. Women are instructed to see a health care provider early in their pregnancy. During their pregnancy, women are given educational materials and nutrition recommendations. Their weight is periodically checked to monitor their nutritional status. It is not surprising that an exercise intervention had no significant influence on the sample's nutritional behaviors.

The study sample reported a strong level of interpersonal relationship support as measured by the HPLP's interpersonal relationship subscale. The sample's mean score on this subscale was 28 out of a possible 36. Although the exercise group exchanged phone numbers and made plans to attend doctor's visits together, they did not socialize outside of pregnancy-related activities. Socialization may have provided support to improve their health responsibility behaviors but did not influence their interpersonal behaviors. In short, the exercise intervention did not affect the exerciser's level of interpersonal

support. In further research, the effect of social networking, which is the gathering information about participants level of social support, should be further evaluated.

The sample also reported "often" participating in spiritual growth-enhancing activities; the mean on that scale was 27, with a possible maximum score of 36. The exercise intervention did not affect the exercise group's level of spiritual growth.

Maternal Discomfort

Hypothesis 5, following completion of a 6-week aquatic exercise program, pregnant women who participate in an aquatic exercise program will have less discomfort than pregnant woman who do not participate in the aquatic exercise program as measured by Smith's Pregnancy Discomfort Intensity index, was accepted.

According to the literature, 50% to 80% of pregnant women complain of low back pain, edema, and other discomforts (Noble 1995; Ostgaard et al., 1994). Low back pain (Davis, 1996), edema (Katz et al., 1990) and leg cramps are the more prevalent discomforts reported by essentially healthy pregnant women (Koniak-Griffin, 1994; Horns et al., 1996). The aquatic intervention used in the study reported here consisted of exercises designed to strengthen abdominal muscles, which would provide greater support for expanding girth of the pregnant woman. Stretching exercises to reduce leg cramps and increase flexibility were included in each session. The unique aquatic environment appears to have had a positive affect on dependent edema associated with pregnancy. The effects of hydrostatic pressure and buoyancy increase venous blood return to the cardiovascular system, and in doing so, increase urinary elimination and reduce edema (Katz et al., 1990).

Mobility

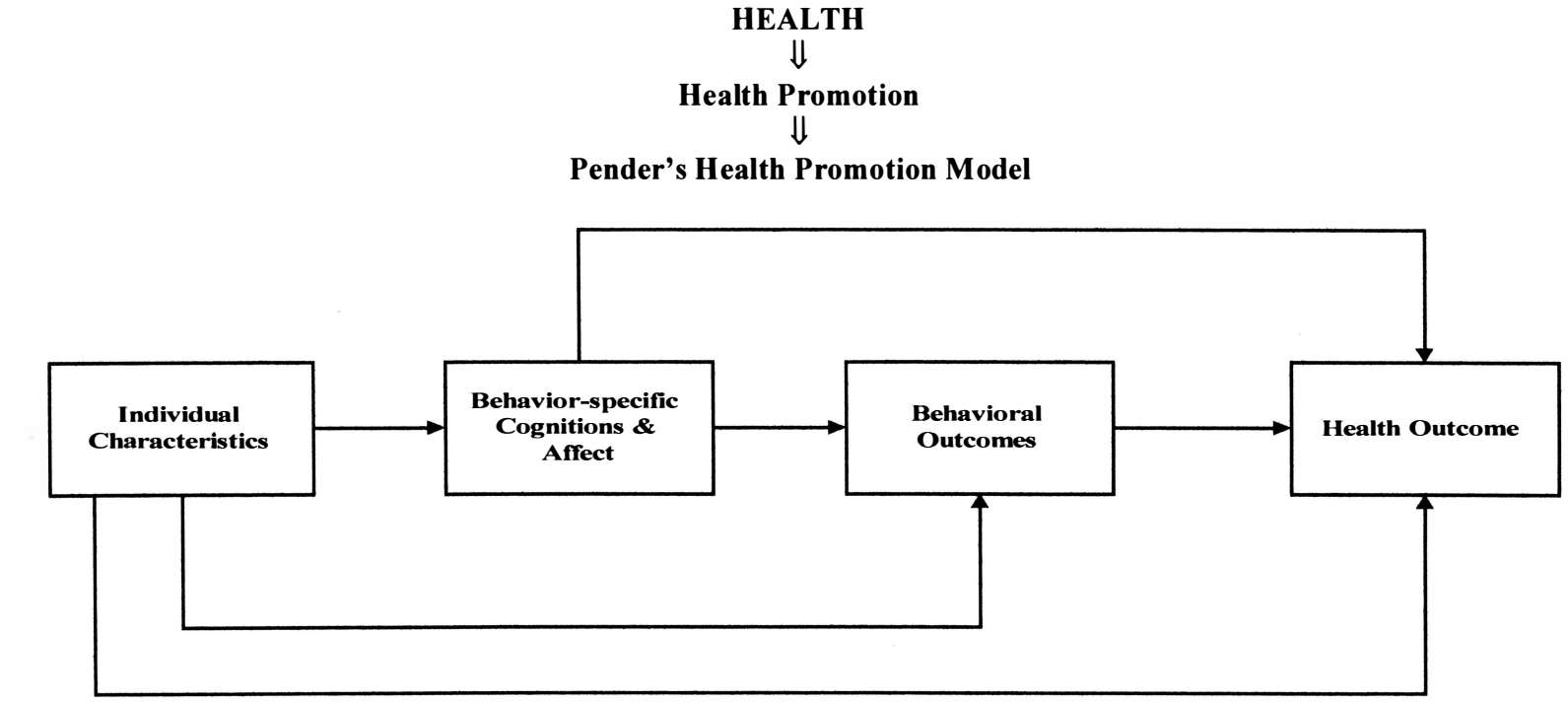
Hypothesis 6, following completion of a 6-week aquatic exercise program, pregnant women participating in an aquatic exercise program will have improved mobility as compared to pregnant women who do not participate in the aquatic exercise program as measured by the Timed Get Up and Go Test, was accepted.

The Timed Get Up and Go Test is a simple measure of physical mobility. Podsialdo and Richardson (1991) classified individuals who were capable of completing the measure in less than ten second as functionally mobile. In the present study, the pretest mobility assessment times ranged from 12.06 to 26.30 seconds with a mean of 17.4. At post-test the mobility times ranged from 11.34 to 29.4 with a mean of 20.5. In analyzing these scores, it appears that pregnancy does impede a person's level of mobility. Prior to this study, there has been a paucity of research on promoting pregnant women's mobility.

Relevance to Nursing Theory

This study used Pender's Health Promotion Model (1996) as the Conceptual-Theoretical-Empirical framework for this study (Figure 3, chapter 1). The empirical components under study were: biological, sociocultural, and psychological individual characteristics; self-efficacy and barriers to action; health-promoting behavior; and mobility and discomfort (Figure 4).

Figure 4. Conceptual Theoretical Empirical Framework with Measures



Biological *	Self-Efficacy	Health-Promoting Behaviors	Mobility
Sociocultural ∇	Barriers to Action	Commitment to Plan of Action	Discomfort
Psychological ψ			
* Gravidity	PHCS	Attendance Record	Smith Pregnancy Discomfort Intensity Index
* Gestational Age	BHPBS	HPLP	Timed Get Up & Go
∇ Demographics			
ψ PBSQ			

The individual characteristics and experiences comprise the distinctive attributes of the individuals being studied. These variables have both direct and indirect effects on behavioral outcomes effects. Prior history and personal factors can affect one's choice of actions and behaviors in subsequent situations. Pender characterized personal factors as biological, psychological and sociocultural factors. In this study, the biological factor of pregnancy may have affected participation health-promoting behaviors. Psychologically, pregnancy challenges a woman's experience of her body by altering her contours and body boundaries. An effort was made by the investigator to include ethnic diversity as a sociocultural factor to make the results more representative of pregnant women.

Pender's second component, behavior-specific cognitions and affect, was measured by the Perceived Health Competence Scale and Barriers to Health-Promoting Behaviors Scale. An activity-related affect such as the belief that aquatic exercise during pregnancy would enhance the pregnancy and reduce discomforts may have a direct or indirect effect on the exercise group's level of participation in health-promoting behaviors. The individuals enrolled in this study did not perceive that any barriers impeded their ability to participate in health-promoting behaviors. A perceived benefit may have been increased mobility in and out of the water.

The third component of the model reflects the commitment to a plan of action and behavioral outcome. Impediments to the plan of action are competing demands and preferences. Demands are defined as conflicts that an individual has little control over, such as family illness or unexpected work demands. Pregnant women involved in the exercise group reported that their absences from the exercise class were caused by health

care visit scheduling conflicts. Likewise, individuals who were employed reported that they missed class because of work schedules. In contrast, competing preferences are alternative behaviors such as skipping class because they were tired or wanted to go to a movie.

The fourth component, health outcome, such as a decrease in maternal discomfort, acted as its own re-enforcer of behavior. For example, pregnant women involved in the exercise component of this study reported relief from pregnancy discomforts for 24 to 36 hours after exercise and increased their mobility out of water, which allowed them to maintain their functional status.

In retrospect, Pender's Health Promotion Model (1996) is by and large a good model for assessing the behavioral factors that may impact health-promoting behaviors in pregnant women. The model facilitated identification of variables important in studying pregnancy related psychological and behavioral factors and provided direction for drawing conclusions. As Pender (1996) proposed, individuals who participate in a health-promoting intervention program, such as exercise, attain a higher level of wellness. However, as the model shows that health outcome may have a non-recursive relationship with behavior change. That is, health outcome may act as both effect on and cause of health related behaviors. Further testing of this relationship will be considered in future studies.

An alternative theoretical framework might be Becker's Health Belief Model (1974). This model attempts to explain and predict health management behaviors, by including economic factors that may influence health promoting behaviors and the effect

of potential barriers. Ajzen and Fishbein's Theory of Reasoned Action (1984) could also be considered because it includes the concepts of behavioral beliefs and intentions as predictors of continued participation in health-promoting behaviors (Fishbein & Middlestadt, 1994).

Limitations

This study was a two group quasi-experimental, pretest/post-test design. Quasi-experimental designs lack one of the two properties that characterize an experimental design, randomization or a control group. In this study, the participants were allowed to self-select assignment to group. Randomization would have minimized the possibility of the confounding variable of self-selection bias.

The women who wanted to be involved in an exercise intervention were limited to an aquatic exercise program at only one location. Women who wanted to participate in other types of exercise were not included in the intervention group. Only individuals who participated in a group exercise program were included in the study. Future research should include individual and group exercise options and randomization to group assignment.

The entire sample was small, with 40 participants, 20 in each group. This sample size was based on the Aquatic Exercise Association's recommendation to keep the ratio of participants per instructor at 20 or below. Although the sample was small, there was adequate power to detect significant relationships.

Implications for Nursing Practice and Research

There has been a paucity of research on relieving the clinical manifestations of maternal discomfort. The current treatments prescribed by health care providers for maternal discomforts related to pregnancy are bedrest, medications, or expensive physical therapy. Although these treatments may reduce the level of discomfort experienced, they may decrease the individual's ability to participate in the activities of daily living. Moreover, for pregnant women with limited financial assets, physical therapy sessions may be not be feasible. Aquatic exercises could be done in an apartment complex swimming pool, neighborhood recreation center, or natural water source such as a lake or ocean. Future research using accessible community-based sites may provide support for the use of alternative locations

Currently, obesity is a prevalent health problem contributing to additional medical conditions such as Type 2 Diabetes and heart disease. Gestational diabetes can be a complication of pregnancy. Exercise has been shown to be effective in treating those predisposed to developing gestational diabetes (Artal, 1996). Muscular activity helps stimulate glucose transport, which may help control gestational diabetes without the use of insulin (Artal, 1996). The American Diabetes Association reports a correlation between pregnancy onset gestational diabetes and the development of Type 2 diabetes later in life. Involving women in an exercise program during their pregnancy could help reduce this sequellae. A longitudinal study to determine if women with gestational diabetes, who exercise during pregnancy, are less prone to developing Type 2 diabetes later in life needs to be considered.

The pregnancy and exercise research literature has predominantly involved white women of upper socioeconomic status. The present study is more representative because it attempts to ensure that pregnant women from various walks of life and different racial identities can express their individual differences and experiences with aquatic exercise. It opens up the possibility of new and more utilitarian information. This study only focused on maternal discomforts prevalent the second and third trimesters of pregnancy. Future studies could be undertaken to determine if exercise has a positive effect on early pregnancy discomforts such as nausea and fatigue. Clapp (1998) has reported that exercise during the first trimester is not detrimental to pregnancy outcome

Maternal research has traditionally focused on aspects of women's health within the narrow boundaries reproductive outcome. Fox and Yamaguchi (1997) reported that British midwifery practice has eliminated maternal weight gain during pregnancy as a measure of pregnancy progress. At present, there has not been any published research on the outcome of this practice on pregnant women's body image perception. Although obstetricians may be reluctant to give up maternal weight gain as measure, nursing could decrease the negative connotation by providing privacy for patients during the weighing process. The study reported here opens opportunities to further research examining the long-term effect of body image problems.

Currently, pregnant women who are experiencing pregnancy related discomforts seek expensive medical care for a problem. Women report missing time from work because of maternal discomfort. Future studies needs to be undertaken to determine if

pregnant women involved in the health-promoting behavior of exercise miss less work than those not participating in exercise is indicated.

In summary, this chapter included a discussion of the findings of a study of the effects of aquatic exercise on pregnant body image, perceived self-efficacy, barriers to participation in health promoting behaviors, health-promoting activities and behaviors, and maternal discomfort. Implications for nursing practice were elucidated. Recommendations for future research in the health promotion field were identified.

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Appendix A

Recruitment Material

Pregnancy Discomforts

Research Program

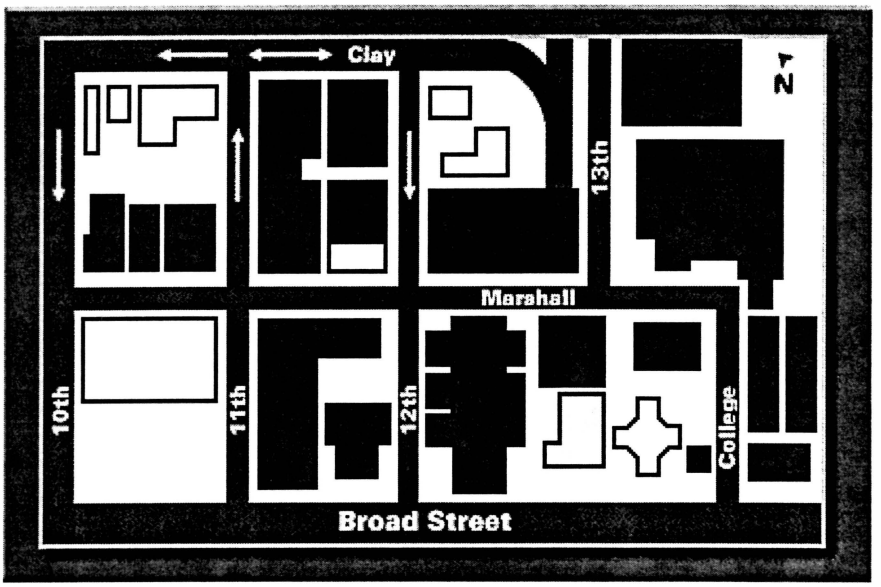
I am seeking pregnant women, both **exercisers** and **non-exercisers**, to participate in a study on the discomforts of pregnancy, who are at least 22 weeks pregnant without medical complications

Program is **free** to research participants. You do not need to know how to swim, we are only waist high in the water. **Your hair will not get wet.**

Prizes and surprise drawings for both exercisers and non-exercisers

If interested:

Please call Sheila Smith RN, PhD candidate at 828-3406



Information and enrollment sessions

At the VCU School of Nursing Located at 1220 East Broad Street. Directions to testing classroom will be posted in the foyer. Refreshments and door prizes!!!!!!

Water Exercise classes will meet at **VCU Recreation Center**
Mondays, Wednesdays, and Fridays from 4:30 pm to 5:30pm.

Questions???

Please call Sheila Smith RN, PhDcandidate at 828-3406

Registration

Exercise

Non Exercise

Please complete the following to receive more information regarding this program. Place in box provided.

Name_____ Age _____

Baby's Due Date_____

Address_____

_____

phone number_____ _____ _____

Home Work other

Prenatal Care at _____

++

Exercise group only complete the next section **Physician permission**

_____ has permission to participate in the pregnancy water exercise program

Restrictions: _____

Signature_____Date_____

Appendix B

Exercise Program

Exercise Program

The following is the exercise format of the aquatic exercise intervention program. Specific description of the exercises are provided in the exercise and muscle involvement handout

Warm Up

March in place knee lifts

March in place knee lifts with figure 8 arms

March in place buttocks kicks with bicep curls

Mini kicks forward with deltoid arms

Mini kicks back with bicep curls

Ski with relaxed arms

Stretch

Overhead tricep stretch

Shoulder Shrug

Arm stretch

Feet stretch and circulate

Thigh lunge

Thigh stretches

Pelvic tilt

Continual Movement

Water jog

Boxer jog

Jumping Jack

Ski

Suspended jacks

Abdominal suspended ski

Pendulum Rock

Rocking Horse

Abdomen workout

Noodle Cycle

Noodle Breast stroke

Swing and Tuck

Abdominal crunch

Pelvic Squats

Cool Down

Spider man lunges

Crab walk

Gastroc stretch

Heart leg frogs

Overhead stretch

Tricep stretch

Stretch and Breathe

Appendix C

Exercisers Brochure

Pregnancy is a special time in a woman's life. Most health care providers encourage women to remain active to help reduce the normal discomforts of pregnancy. Some of the benefits of exercise include helping you feel more relaxed, improving circulation, strengthening your abdominal and back muscles, and giving you more energy and better mobility.

Water adds fun to exercise. The magic lies in water's ability to support the body. There is a sense of freshness caused by the cool water on your body!!

Buoyancy is an upward "push" that acts opposite gravity, which holds a body down. When you stand in chest deep water you feel 75% lighter. If you weigh 132 pounds you **feel like** you weigh 32 pounds.

Water Pressure is the presence of water on your body. This pressure may decrease the swelling in your legs because it improves circulation

.

Resistance It is more difficult to walk through water than thin air. Increased resistance makes you work harder in the water while your weight is supported by buoyancy

SAFETY

Good posture should be maintained while you are expecting. Posture demonstration and reminders will be done in class.

Foot position Because of buoyancy, people tend to walk on their toes or balls of their feet. Please walk and land on the whole foot. Landing on your toes can increase leg cramps during and after class.

Pain or Discomfort Signal the instructor **immediately** if you have pain or discomfort. Return to neutral position and walk to the edge of the pool until the assistant comes to you.

There is a lifeguard at all times.

Blood pressure will be taken weekly. An elevation in your blood pressure will need to be discussed and reported to your health care provider. A woman with blood pressure elevation will not able to exercise for that day.

Hydration Even though you are in the water, you need to drink plenty of water before, during and after exercising. Bring your plastic water bottle to class. You may keep it at the poolside and drink periodically during class.

Fatigue and Exertion If you feel like you are getting too tired, slow down, but keep moving. You will be taught how to measure how hard you are exercising.

Pregnancy You will need to get your health care provider's consent to participate in this program.

Jumping Jack:: Jump to a side stride with legs slightly more than shoulder width apart. Extend arms to shoulder height. Push arms to side of thighs as legs close. This can be done single or double legs. Arms can vary to front and back crosses

Mini Kicks: Stand with feet slightly spread apart. Start low kicks forward (no higher than 5 to 6 inches off pool floor), use alternating arms movements for balance and resistance. (8 sets forward) Kicks to rear only 3 to 5 inches off pool floor to prevent arching of the lower back. Alternate arm motion can be alternating biceps curls or deltoid arms curls

March in Place Knee Lifts/Buttocks Kicks: Stand chest deep in the water. Slowly, start a marching motion. Alternate legs, one leg should always be on pool floor. Motion is rhythmic, slow not jogging. Add figure 8 arms after 2 sets of 8. Change to kicking slowly with heels toward buttocks change arms to deltoid arms curls or biceps curls.

Figure 8 Arms: Extend your arms forward at a 45^0 Move your arms in tracing the shape of an 8.

Ski with Relaxed Arms: Stand with one leg slightly forward and other leg extended to the rear. Slide your feet forward and backward with the opposite arm extended with elbows slightly bent and relaxed. Rotate hands as the arms move forward and backward for balance of arms groups and resistance.

Overhead Triceps Stretch: Stand with feet shoulder width apart, knees slightly bent. Raise one arm overhead, bending elbow so that the fingers touch the opposite shoulder. Grasp your arm with the opposite arm, slowly stretch the triceps muscle. Hold for 30 seconds. Repeat with other arm

Cross Chest Stretch: Stand with knees slightly bent. Raise arms to shoulder height, reach arm across body at nipple level, grasp arm either below or above elbow, gently stretch. Hold for 30 seconds.

Thigh Stretch/ Foot Rotation: Bend right knee, place hands under thigh. Gently pull knee towards the chest. Add point and flexion of the foot, rotate ankle clockwise and then counter clockwise. Extend leg to water level, extend arms towards feet, grasp extended leg to stretch hamstring

Thigh lunge/ Toe-Heel Raises: Stand with one leg forward, bend knee slightly (knee should not go past foot). Rear leg is extended keep heel on pool floor. Shift weight to rear leg, keeping forward foot's heel on pool floor, lift toes slightly to stretch calf. Alternate legs.

Pelvic Tilt: Stand in waist deep water with your back against pool wall with feet shoulder width apart and knees slightly bent. Rest hands on hip bones. Tilt the pelvis forward by pressing the small of the back against pool wall.

Water Jog: Maintaining body in a neutral position (head and chest erect, shoulders relaxed and down) Alternate knees to chest with arms alternating pushing up and down for balance.

Boxer Jog: Extend legs to shoulder width apart. Lift right knee to left hand, Alternate legs. After a set of 8, bring legs to neutral position, right leg to right hand.

Ski with Lift: Stand with one leg slightly forward and other leg extended to the rear. Slide your feet forward and backward with the opposite arm extended with elbows slightly bent. Rotate hands as the arms move forward and backward for balance of arms groups and resistance. Elevate body slightly off pool floor.

Suspended Jumping Jack:: Jump to a side stride with legs slightly more than shoulder width apart. Extend arms to shoulder height. Push arms to side of thighs as legs close. Bring legs back to center in a tuck position, exhale during tuck. Feet do not touch ground in the center tuck position

Suspended Ski with Tuck: Stand with one leg slightly forward and other leg extended to the rear. Slide your feet forward and backward with the opposite arm extended with elbows slightly bent. As legs meet under the body, pull legs towards abdomen then complete legs switch. Rotate hands as the arms move forward and backward for balance of arms groups and resistance.

Pendulum Rock: Stand with legs apart slightly more than shoulder width apart. Lift left leg off pool floor. Extend arms toward right side, elbows slightly bent .Switch weight to right leg while swinging arms toward left side.

Rocking Horse: Extend arms forward. Rock forward on to one foot. Lift rear foot towards buttocks. Alternate placing weight on front and rear foot. After 8 repetitions switch legs. To increase intensity move forward in the water

Noodle Cycle: Place water noodle under arms. Lean to one side at a 45 degree angle. Extend legs off pool floor. Rotate legs in a cycling motion

Noodle Breast Stroke: Place noodle support between legs. Sit erect and astride the water noodle. Legs are in sitting in a chair position. Breast stroke using only the arms to move forward.

Side Swing and Tuck: Place water noodle under arms. Extend legs to one side off pool floor. Swing legs toward the opposite side. As the legs come under the body, tuck legs toward abdomen and extend to opposite side.

Swing and Tuck: Place water noodle under arms. Extend legs forward in a lounge chair position. Contract abdominal muscles. Pull legs toward abdomen, lean upper portion of the body forward, extend legs out behind the body. Reverse

Abdominal Crunch: Place water noodle under the arms .Lift the feet off pool floor. Bend the knees into a kneeling position. Contract the abdominal muscles. Slightly incline upper body approximately 20 degrees, exhale during abdominal crunch. Straighten and inhale.

Oblique Crunch: Place water noodle under the arms .Extend legs forward in a lounge chair position, slightly turn knees toward the left. Slightly incline upper body approximately 20 to 30 degrees bring in the right shoulder to rotated knees, exhale during oblique crunch. Straighten and inhale. Do 8 repetitions and rotate legs.

Crab Walk: Assume a squatting position with knees pointing outward 45 degrees. Lift both feet off the pool floor about 2 inches. Move forward across the pool.

Spiderman Stretch: Holding on to the side of the pool. Stand with feet shoulder width apart. Bend both legs and place feet on the side of the pool. Bend one knee, slide and extend opposite leg. Hold stretch for 30 seconds and reverse movement.

Stretch and Breathe: Stand on tiptoes. Inhale and extend the arms overhead. Bringing arms down exhale. Repeat

Appendix D

Research Instruments

Welcome to the

Discomforts of Pregnancy

Study

Thank you for your

willingness to participate

Sheila Smith RN, PhD candidate

If you have any questions please let me

know

828-3406

Participant NUMBER _____

1. Age _____

2. Height _____

3. Weight at last visit _____

4. Ethnic origin **White**

please circle **Black**

Asian

Hispanic

Native American

Other

5. Baby's due date _____

6. What number pregnancy is this? _____

vaginal **c/s**

7. How many babies have you delivered _____

8. Age of children at home _____

9. Last grade completed in school _____

10 What prenatal classes have attended? _____

---

11. Baby feeding plan ***Breast***

Bottle

Please circle choice ***Both***

12. Over the past 18 months, what percentage (%) of the weeks would you say you were regularly physically active at moderate intensity? Moderate intensity means exercising 30 minutes at least 4 times per week, such as a brisk walk. Circle the % that best describes your activity level

0% 10% 20% 30% 40% 50%

60% 70% 80% 90% 100%

13. Do you know how to swim ? ***Yes No***

14. Health Care Provider ***Obstetrician***

Family Practice Doctor

Midwife

15. At work, I have to stand for long periods of time **yes no**

16. At work, I have to do heavy lifting **yes no**

17. At work, I have to sit for a long time without a break **yes no**

Smith Pregnancy Discomfort Intensity Index

Directions: Please circle a box both PRESENCE and INTENSITY FOR EACH OF THE FOLLOWING QUESTIONS

Discomforts	I Have		How Bad/Intensity			
Back Pain	yes	no	no discomfort	mild	moderate	severe
Leg Cramps	yes	no	no discomfort	mild	moderate	severe
Swelling	yes	no	no discomfort	mild	moderate	severe

PREGNANT BSQ

We should like to know how you have been feeling about your appearance. Please read each question and circle the appropriate number to the right. Please answer all the questions.

	Never	Rarely	Sometimes	Often	Very Often	Always
1. Has feeling bored made you brood about your shape?	**1**	**2**	**3**	**4**	**5**	**6**
2. Have you been so worried about your shape that you have been feeling that you ought to diet?	**1**	**2**	**3**	**4**	**5**	**6**
3. Have you thought that your thighs, hips or bottom are too large for the rest of you?	**1**	**2**	**3**	**4**	**5**	**6**
4. Have you been afraid that you might become fat (or fatter)?	**1**	**2**	**3**	**4**	**5**	**6**
5. Have you worried about your flesh not being firm enough?	**1**	**2**	**3**	**4**	**5**	**6**
6. Has feeling full (e.g. after eating a large meal) made you feel fat?	**1**	**2**	**3**	**4**	**5**	**6**

	Never	Rarely	Sometimes	Often	Very Often	Always
7. Have you felt so bad about your shape that you have cried?	**1**	**2**	**3**	**4**	**5**	**6**
8. Have you avoided running because your flesh might wobble?	**1**	**2**	**3**	**4**	**5**	**6**
9. Has being with thin women made you feel self-conscious about your shape?	**1**	**2**	**3**	**4**	**5**	**6**
10. Have you worried about your thighs spreading out when sitting down?	**1**	**2**	**3**	**4**	**5**	**6**
11. Has eating even a small amount of food made you feel fat?	**1**	**2**	**3**	**4**	**5**	**6**
12. Have you noticed the shape of other pregnant women and felt that your own shape compared unfavorably?	**1**	**2**	**3**	**4**	**5**	**6**
13. Has thinking about your shape interfered with you ability to concentrate (e.g., while watching television, reading, listening to conversations)?	**1**	**2**	**3**	**4**	**5**	**6**

	Never	Rarely	Sometimes	Often	Very Often	Always
14. Has being naked, such as when taking a bath, made you feel fat?	**1**	**2**	**3**	**4**	**5**	**6**
15. Have you avoided wearing clothes which make you particularly aware of the shape of your body?	**1**	**2**	**3**	**4**	**5**	**6**
16. Have you imagined cutting off fleshy areas of your body?	**1**	**2**	**3**	**4**	**5**	**6**
17. Has eating sweets, cakes or other high calorie food made you feel fat?	**1**	**2**	**3**	**4**	**5**	**6**
18. Have you not gone out to social occasions (e.g. parties) because you have felt bad about your shape?	**1**	**2**	**3**	**4**	**5**	**6**
19. Have you felt excessively large and rounded?	**1**	**2**	**3**	**4**	**5**	**6**
20. Have you felt ashamed of your body?	**1**	**2**	**3**	**4**	**5**	**6**

	Never	Rarely	Sometimes	Often	Very Often	Always
21. Has worry about your shape made you diet?	**1**	**2**	**3**	**4**	**5**	**6**
22. Have you felt happiest about your shape when your stomach has been empty (e.g. in the morning)?	**1**	**2**	**3**	**4**	**5**	**6**
23. Have you thought that you are the shape you are because you overeat	**1**	**2**	**3**	**4**	**5**	**6**
24. Have you worried about other people seeing rolls of flesh around your waist or stomach?	**1**	**2**	**3**	**4**	**5**	**6**
25. Have you felt that it is not fair that other pregnant women are thinner than you?	**1**	**2**	**3**	**4**	**5**	**6**
26. Have you vomited in order to feel thinner?	**1**	**2**	**3**	**4**	**5**	**6**
27. When in company have you worried about taking up too much room (e.g. sitting on a sofa or bus seat)?	**1**	**2**	**3**	**4**	**5**	**6**

	Never	Rarely	Sometimes	Often	Very Often	Always
28 Have you worried about your flesh being dimply?	**1**	**2**	**3**	**4**	**5**	**6**
29. Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?	**1**	**2**	**3**	**4**	**5**	**6**
30. Have you pinched areas of your body to see how much fat there is?	**1**	**2**	**3**	**4**	**5**	**6**
31. Have you avoided situations where people could see your body (e.g. communal changing rooms or swimming baths)?	**1**	**2**	**3**	**4**	**5**	**6**
32. Have you taken laxatives in order to feel thinner?	**1**	**2**	**3**	**4**	**5**	**6**
33. Have you been particularly self-conscious about your shape when in the company of other people?	**1**	**2**	**3**	**4**	**5**	**6**
34. Has worry about your shape made you feel you ought to exercise?	**1**	**2**	**3**	**4**	**5**	**6**

Perceived Health Competence (Self-Efficacy) Scale

Please answer the following 8 questions by circling the statement which you feel describes how you feel

1. **I handle myself well with respect to my health.**

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

2. **No matter how hard I try, my health just doesn't turn out the way I would like.**

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

3. **It is difficult for me to find effective solutions to the health problems that come my way.**

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

4. **I succeed in the projects I undertake to improve my health.**

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

5. **I'm generally able to accomplish my goals with respect to my health.**

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

6. **I find my efforts to change things I don't like about my health.**

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

7. Typically, my plans for health don't work out well.

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

8. I am able to do things for my health as well as most other people.

Strongly Agree *Agree* *Uncertain* *Disagree* *Strongly Disagree*

(Smith, Wallston, & Smith, 1995)

Barriers to Health Promoting Behaviors Scale

People sometimes have problems doing what they want to do to stay healthy. Please circle the number which best indicates how much each of these problems keeps you from taking care of your health.

	Never	Sometimes	Often	Routinely
1. Lack of convenient facilities	1	2	3	4
2. Too tired	1	2	3	4
3. Lack of transportation	1	2	3	4
4. Feeling what I do doesn't help	1	2	3	4
5. Lack of money	1	2	3	4
6. Impairment	1	2	3	4
7. No one to help me	1	2	3	4
8. Not interested	1	2	3	4
9. Lack of Information about what to do	1	2	3	4
10. Embarrassment about my appearance	1	2	3	4
11. Concern about safety	1	2	3	4

12. Lack of support from family or friends	1	2	3	4
13. Interferes with other responsibilities	1	2	3	4
14. Lack of time	1	2	3	4
15. Feeling I can't do things correctly	1	2	3	4
16. Difficulty with communication	1	2	3	4
17. Bad weather	1	2	3	4
18. Lack of help from health care professionals	1	2	3	4

Other reasons_____

(Becker, Stuifbergen, & Sands, 1991)

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

1.	Discuss my problems and concerns with people close to me.	**N**	**S**	**O**	**R**
2.	Choose a diet low in fat, saturated fat, and cholesterol.	**N**	**S**	**O**	**R**
3.	Report any unusual signs or symptoms to a physician or other health professional.	**N**	**S**	**O**	**R**
4.	Follow a planned exercise program.	**N**	**S**	**O**	**R**
5.	Get enough sleep.	**N**	**S**	**O**	**R**
6.	Feel I am growing and changing in positive ways.	**N**	**S**	**O**	**R**

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

7.	Praise other people easily for their achievements.	**N**	**S**	**O**	**R**
8.	Limit use of sugars and foods containing sugar (sweets).	**N**	**S**	**O**	**R**
9.	Read or watch TV programs about improving health.	**N**	**S**	**O**	**R**
10.	Exercise vigorously for 20 minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber).	**N**	**S**	**O**	**R**
11.	Take some time for relaxation each day.	**N**	**S**	**O**	**R**
12.	Believe that my life has purpose.	**N**	**S**	**O**	**R**

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

13.	Maintain meaningful and fulfilling relationships with others.	**N**	**S**	**O**	**R**
14.	Eat 6-11 servings of bread, cereal, rice, and pasta each day.	**N**	**S**	**O**	**R**
15.	Question health professionals in order to understand their instructions.	**N**	**S**	**O**	**R**
16.	Take part in light to moderate physical actvity (such as sustained walking 30-40 minutes 5 or more times a week).	**N**	**S**	**O**	**R**
17.	Accept those things in my life which I can not change.	**N**	**S**	**O**	**R**
18.	Look forward to the future.	**N**	**S**	**O**	**R**

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

19.	Spend time with close friends.	**N**	**S**	**O**	**R**
20.	Eat 2-4 servings of fruit each day.	**N**	**S**	**O**	**R**
21.	Get a second opinion when I question my health care providers advice.	**N**	**S**	**O**	**R**
22.	Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling).	**N**	**S**	**O**	**R**
23.	Concentrate on pleasant thoughts at bedtime.	**N**	**S**	**O**	**R**
24.	Feel content and at peace with myself.	**N**	**S**	**O**	**R**
25.	Find it easy to show concern, love, and warmth to others.	**N**	**S**	**O**	**R**

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

26.	Eat 3-5 servings of vegetables each day.	**N**	**S**	**O**	**R**
27.	Discuss My health concerns with health professionals.	**N**	**S**	**O**	**R**
28.	Do stretching exercises at least 3 times a week.	**N**	**S**	**O**	**R**
29.	Use specific methods to control my stress.	**N**	**S**	**O**	**R**
30.	Work toward long-term goals in my life.	**N**	**S**	**O**	**R**
31.	Touch and am touched by people I care about.	**N**	**S**	**O**	**R**
32.	Eat 2-3 servings of milk, yogurt, or cheese each day.	**N**	**S**	**O**	**R**

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

33.	Inspect my body at least monthly for physical changes/danger signs.	**N**	**S**	**O**	**R**
34.	Get exercise during usual daily activities (such as walking during lunch, using stairs instead of elevators, parking car away form destination and walking).	**N**	**S**	**O**	**R**
35.	Balance time between work and play.	**N**	**S**	**O**	**R**
36.	Find each day interesting and challenging.	**N**	**S**	**O**	**R**
37.	Find ways to meet my needs for intimacy.	**N**	**S**	**O**	**R**
38.	Eat only 2-3 servings from the meat, poultry, fish, dried beans, eggs, and nuts food group each day.	**N**	**S**	**O**	**R**

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

39.	Ask for information from health professionals about how to take good care of myself.	**N**	**S**	**O**	**R**
40.	Check my pulse rate when exercising.	**N**	**S**	**O**	**R**
41.	Practice relaxation or meditation for 15-20 minutes daily.	**N**	**S**	**O**	**R**
42.	Am aware of what is important to me in life.	**N**	**S**	**O**	**R**
43.	Get support from a network of caring people.	**N**	**S**	**O**	**R**
44.	Read labels to identify nutrients, fats, and sodium (salt) content in packaged foods.	**N**	**S**	**O**	**R**
45.	Attend educational programs on personal health care.	**N**	**S**	**O**	**R**

Directions: **This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate how often you engage in each behavior by circling:**

N for "Never"
S for "Sometimes"
O for "Often"
R for "Routinely"

46.	Reach my target heart rate when exercising.	**N**	**S**	**O**	**R**
47.	Pace myself to prevent tiredness.	**N**	**S**	**O**	**R**
48.	Feel connected with some force greater than myself.	**N**	**S**	**O**	**R**
49.	Settle conflicts with others through discussion and compromise.	**N**	**S**	**O**	**R**
50.	Eat breakfast.	**N**	**S**	**O**	**R**
51.	Seek guidance or counseling when necessary.	**N**	**S**	**O**	**R**
52.	Expose myself to new experiences and challenges.	**N**	**S**	**O**	**R**

Appendix E

Informed Consent

RESEARCH SUBJECT INFORMATION AND CONSENT FORM

TITLE: **Effects of an Aquatic Exercise Intervention Program on the Discomforts of Pregnancy**

PROTOCOL **VCU #**

SPONSOR: None

INVESTIGATOR: **Rita Pickler, PhD, RN, PNP**
Virginia Commonwealth University (VCU)
School of Nursing
PO Box 980567
1220 East Broad Street
Richmond, VA 23298-0567
(804) 828-0721

Sheila A Smith, MSN, RN, PhDc
Virginia Commonwealth University (VCU)
School of Nursing
PO Box 980567-0567
1220 East Broad Street
Richmond, VA 23298
(804) 828-3406

PURPOSE OF THE STUDY:

This consent form may contain words that you do not understand. Please ask the researcher to explain any words or information that you do not clearly understand. You may take an unsigned copy of this consent form to think about or discuss with family or friends before making your decision.

DESCRIPTION OF THE STUDY

If you participate, you may choose to be in an exercise or no exercise group. You are not required to know how to swim, since water is only 4 feet deep. A lifeguard will be on duty at all times.

The exercise group will participate in a water exercise 3 times a week at the Virginia Commonwealth University pool located on the MCVH campus and fill out questionnaires and complete a movement exam. Your height and weight will also be measured. These questionnaires and tests will need to be repeated 6 weeks later.

The non exercise group will be asked to fill out a questionnaire 2 times and complete a movement exam. Your height and weight will also be measured. These questionnaires and tests will need to be repeated 6 weeks later.

PROCEDURES:

If you decide to be in this research study, you will be asked to sign a consent form after you have had all your questions answered. You will be asked to complete a questionnaire, your height and weight will be measured, and your mobility level will be evaluated. This procedure will be repeated 6 weeks later.

RISKS AND DISCOMFORTS:

There are no foreseen risks to you as a result of your participation in this study.

BENEFITS:

You will derive no personal benefit from this study. However, your participation may benefit other pregnant women by helping investigator to learn about the effects of water-based participation in exercise on the discomforts of pregnancy

COSTS:

There is no monetary costs for participation; the exercise group will require a 60-minute class 3 times per week. The pretest and the posttest measures will take approximately 1 hour.

PAYMENT FOR PARTICIPATION:

After testing is pretesting is completed, you will receive a $10 gift certificate; after posttest is completed you will receive another $10 gift certificate for use at a local restaurant or grocery store. If you complete the program your name will be submitted in a drawing for a $100 infant layette.

CONFIDENTIALITY:

This signed confidentiality form may be looked and/copied for research or regulatory purposes by VCU and School of Nursing.

Absolute confidentiality cannot be guaranteed because of the need to of the need to give information to those parties. The results of this research study may be presented at meetings or in publications. Your identity will not be disclosed in those presentations. The consent form signed by you will be looked at and/or copied for research or

regulatory purposes by the principal investigator and any bodies that need to see it for purposes of regulating research procedures.

COMPENSATION FOR INJURY:
In the event of physical and/or mental injury resulting from your participation in this research study, Virginia Commonwealth University and MCV Hospitals will not provide compensation. If injury occurs, medical treatment will be available at the MCV Hospitals. Fees for such treatment will be billed to you or to appropriate third party insurance. Your health insurance company may or may not pay for treatment of injuries as a result of your participation in this study.

VOLUNTARY PARTICIPATION/WITHDRAWAL:
Participation in this study is voluntary. The researcher will answer any questions you may have about the study. You may decide not to participate in this study. You are free to withdraw your consent and discontinue your participation at any time. If you decide to withdraw from this study, you should contact Sheila Smith at (804)-828-3406. Your decision will no way affect the quality of care you will receive now or in the future at MCVH.

QUESTIONS:
In the future, you may have questions about your study participation. If you have any questions about the research **please call Sheila Smith at 804-828-3406 or Rita Pickler at 804-828-3406**

If you have any questions concerning your rights as a research subject, you may contact:

Office of Research Protection
Virginia Commonwealth University
1101 E. Marshall Street, room B1-001
Richmond, VA 232298
Telephone: 804-828-0868

Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all of your questions.

CONSENT:
I have read this consent form and initialed each page. I understand the information about this study. All my questions about the study and all my questions about my participation in it have been answered. I freely consent to participate in this research study.

I understand that I will receive a signed and dated copy of this consent form.

By signing this consent form, I have not waived any of the legal rights which I otherwise would have as a subject in a research study.

_____

Subject's Name (please print)

SIGNATURES:

_____

Subject's Signature Date

_____

Investigator Signature Date

Vita