2001

A postpartum progressive resistance exercise program

Wendy L. Du Bois
San Jose State University

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

ProQuest Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

UMI®

A POSTPARTUM PROGRESSIVE RESISTANCE EXERCISE PROGRAM

A Project Report

Presented to

The Faculty of the Department of Human Performance

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

By

Wendy L. Du Bois

December 2001

APPROVED FOR THE DEPARTMENT OF HUMAN PERFORMANCE

Dr. David Furst, Chair

Dr. Peggy Plato

Dr. Emily H. Wughalter

APPROVED FOR THE UNIVERSITY

ABSTRACT

A POSTPARTUM PROGRESSIVE RESISTANCE EXERCISE PROGRAM

by Wendy L. Du Bois

The purpose of the project was to create a progressive resistance program of exercises for postpartum women. The program was in the form of a manual with text describing each exercise and photographs illustrating proper technique. Research was synthesized from topics on women and exercise, exercise adherence of women, physiological changes during pregnancy and postpartum, and postpartum exercise to obtain information relevant in creating the program. Mothers and experts in obstetrics, early childhood development, exercise physiology, and exercise biomechanics reviewed the manual. Their overall response was strongly positive. Suggestions for future revisions included using a more accessible writing style, emphasizing infant safety, adding exercises for the back, and adding a chapter on how aerobic and anaerobic exercise complement one another.

DEDICATION

This project is dedicated to Morgan, one of the best sources of inspiration I could ever wish for, and Eric, who once again proved to me why I am so fortunate to have him as my best friend. With the two of you, my dream came true.

ACKNOWLEDGMENTS

No body of work is ever produced in isolation. There have been so many wonderful people who have gone out of their way to make this project a success.

To my ever patient committee chairman, Dr. David Furst: thank you for your support from the day I inquired about the graduate program to consenting to chair my thesis committee. You have truly been a mentor for me.

To my outstanding professors at San Jose State University, Dr. Peggy Plato and Dr. Emily H. Wughalter: thank you for allowing me the latitude and giving me the support to pursue a project so near to my heart.

To the models, Marcia, Peter, Jennifer, Dillon, Connor, Gail, Thomas, Kelli, Nora, Maureen, and Joseph: thank you for allowing the spontaneous joy you feel while playing with your children to be captured on film.

To the numerous reviewers who continuously help me improve this project: thank you for your precious time to make this project a success.

Lastly, thank you to my family: you have always been there providing encouragement and support throughout the entire process.

TABLE OF CONTENTS

Table of Appendices

Table of Figures

Table of Tables

Chapter 1

INTRODUCTION

The purpose of the project was to create a progressive resistance program of exercises for postpartum women. The exercise program was in the form of a manual with text describing each exercise and photographs illustrating proper exercise technique (Appendix A).

Importance of Physical Activity for Women

Daily physical activity is important for everyone's overall good heath and well-being (American College of Sports Medicine [ACSM], 1998). The ACSM recommends that an exercise program consisting of aerobic, resistance, and flexibility exercises become a consistent part of every adult's lifestyle because sedentary people have a higher risk of developing coronary heart disease, stroke, some cancers, osteoporosis, and diabetes mellitus (ACSM, 1998; National Center for Chronic Disease Prevention, 1999)). Sadly, greater than 25% of women lead a sedentary lifestyle (ACSM, 1999). However, there is evidence that participation in regular physical activity can help decrease the risks of developing the diseases associated with a sedentary lifestyle.

Regular exercise can help women reduce the risk of coronary heart disease and stroke (Hu, Stampfer, & Colditz, 2000; Manson, Hu, & Edwards, 1999; Stampfer, Hu, & Manson, 2000). Manson et al. found women who consistently walked or participated in more vigorous exercise had a much lower risk of coronary heart disease than sedentary women. Hu et al. determined that moderate intensity physical activity (such as brisk walking) substantially reduced women's risk of stroke.

The risk of reproductive and breast cancers can also be reduced with regular exercise. In a study conducted on athletic and nonathletic women, Tangley and Miller (1988) compared the incidence of cancer of the reproductive system and breast between the two groups. They found nonathletic women two and a half times more likely to have cancer of the reproductive system and twice as likely to have breast cancer than athletes.

Occurring much more often in women than men, osteoporosis is a disease in which bone density has significantly decreased. The decreased density can lead to bone fractures, especially of the vertebrae, femur, and radius (Durstine, King, Painter, Roitman, & Zwiren, 1993). Although the disease does not usually occur until after menopause, achieving the proper amount of bone density as a young adult reduces the risk of osteoporosis later in life. When done regularly, exercise can help minimize and reduce the risk of osteoporosis by stimulating the bones of the body, helping them maintain adequate bone density (Keen, 1999).

Women's bodies appear to have a higher occurrence of substantial weight gain during adulthood than men (Dipietro, 1999). Of women over 20 years of age, more than 50% are overweight or obese (ACSM, 1999). Obesity is one of the major risk factors for acquiring diabetes mellitus (known as Type II or adult onset diabetes). Diabetes mellitus affects 8% of all women older than 20 years, and 80% of women with diabetes mellitus will die due to some form of cardiovascular disease. Along with a healthy diet, regular exercise can help control body weight and reduce the risk of developing diabetes mellitus (Dipietro, 1999).

Regular physical activity plays an important role in reducing the risk of coronary heart disease, stroke, reproductive and breast cancers, osteoporosis, and diabetes mellitus for women.

Opportunity to Reach Sedentary Women

Because life-threatening conditions can be mitigated with exercise, it is important to encourage all women, especially those who are sedentary, to exercise. During major life transitions there appear to be windows of opportunity during which a person may be more open to make positive lifestyle changes. These times occur when there are changes in social roles, social support, health status, and personal resources (Devine, Bove, & Olson, 2000; Godin, Vezina, & Lecleric, 1989; Gruis, 1977; Young & King, 1995). The postpartum period can be a window of opportunity to reach women interested in making positive lifestyle changes. Gruis noted that after delivery, a woman is learning about the changes her body is undergoing to return to its former prepregnant state. He thought this learning opportunity could be expanded to include information on healthy exercise and diet strategies. Devine and Olson (1992) found many women with young children have the preconceived idea that a mother should behave as a positive role model for her children. Devine and Olson examined mothers at three different stages in their lives (children under 9 years living at home, children over 9 years living at home, and grown children living away from home). The "mothering" group (those women who had children under the age of 9 living at home) believed they should eat healthy meals in order to model good diet and health habits for their children, despite the temptation to eat anything filling (not necessarily nutritious) to save time in

their busy days. It may be possible to capitalize on the educational opportunity of postpartum physical changes and a mother's desire to be a positive role model by providing information and opportunities for mothers to explore the health benefits of regular exercise.

Maximizing Postpartum Exercise Adherence

As with any group contemplating beginning an exercise program, there are barriers to commencing and continuing the program. Some barriers to exercise for postpartum women include existing needs for more energy, time, and safe and reliable childcare (Artal & Buckenmeyer, 1995; Brehm, 1989; Clapp & Little, 1995; Devine et al., 2000). There is also a lack of information given to many women by their health care providers on what exercises are safe and effective during the postpartum period (Devine et al., 2000). Many postpartum women want information on exercise, but are hesitant to ask their primary health care providers for fear of "disturbing" busy practitioners with their questions (Gruis, 1977). A successful exercise program for postpartum women would need to address the issues of lack of energy, time, safe and reliable childcare, and provide information on safe and effective exercises.

There are specific features of exercise programs that promote adherence to the exercise. Some features of adherence include a low probability of injury (exercises are low-impact, low-to-moderate intensity, and of a relatively short duration), emphasis on variety and fun (games are used as a proxy for the exercise), use of personal goals and contracts, assessing and monitoring progress of fitness changes, utilizing music with the exercise, and providing positive feedback to the person exercising (Franklin, 1988). By combining the features

that address barriers to exercise adherence for postpartum women as well as incorporating general features that promote exercise adherence, a useful exercise program tailored to the specific needs of postpartum women can be created.

Design of Postpartum Exercise Program

To create an exercise program valuable to postpartum women, a postpartum progressive resistance exercise program was designed, incorporating selected barriers to exercise for postpartum women, features relevant to a resistance exercise program that promote exercise adherence, and the ACSM's guidelines for resistance exercise. Progressive resistance exercise was chosen for this project because there was very little information available on appropriate resistance exercises for postpartum women. Progressive resistance exercise has the additional advantage of being "portable"; it can be done almost anywhere as long as appropriate resistive weights are available. Resistance weights for postpartum women include their infant and simple, everyday objects found in the home (water jugs, jars of food, or even plastic shopping bags loaded with objects). Unlike aerobic exercise, a resistance exercise program can be interrupted between sets, resumed at a later time during the same day, and still be effective at increasing strength and endurance.

Features of a Postpartum Progressive Resistance Exercise Program Manual

Exercises are simple to do. To address the barriers of lack of energy and time, the exercise program included exercises that were simple to do and understand. The exercises could be done at home, at a mother's convenience. They were also low-impact, had relatively short durations, and the intensity could be directly controlled by a mother. The manual gave mothers quick access

to exercise information by providing photographs and text descriptions of each exercise as well as a pictorial summary of the entire exercise program.

Exercises as play with baby. The exercises in the manual were designed so that they could be done with an infant and without outside childcare requirements. The manual also provided children's songs with the exercises, enabling mothers to sing songs to children as they exercised. The music served both to entertain the child as well as give a mother a rhythm with which to move through a set of repetitions. The game-like interaction between mother and child, as well as the use of music, may enhance exercise adherence.

Relatively short duration of time needed. The ACSM recommends that resistance exercises should take less than 1 hour total time to complete (ACSM, 1998). Exercise adherence is also increased with shorter duration exercise programs. The resistance exercises chosen for the program needed relatively little time to complete or could be completed in parts at various times throughout a day. This attribute made the program more flexible, an important feature to a mother who has great demands placed on her time.

Each major muscle group used and strength and endurance increased. In keeping with the ACSM's recommendation on resistance exercise program characteristics, the program included effective exercises for each major muscle group (ACSM, 1998). To track the progress of strength gains and exercise adherence, an exercise log was supplied in the manual. Additionally, an outline for setting fitness goals was also included. Exercise logs, personal goals, and contracts were provided to enhance exercise adherence.

Project Tasks

The composition of the manual consisted of seven phases: literature review, resistance exercise program text, creative exercise adaptation, composition of exercise manual, expert critique of the manual, data analysis, and project report composition.

Limitations

The following limitations were identified for this project:

1. There are relatively few studies on exercise during the postpartum period; therefore, research was synthesized from a variety of topics to obtain more complete information relevant to creating a postpartum progressive resistance exercise program. Topics researched included women and exercise, physiological changes during pregnancy and postpartum, lactation and exercise, pregnancy and resistance exercise, and postpartum exercise. The little research that currently exists specifically on postpartum exercise has been primarily conducted using aerobic exercises and has been found to be safe.

2. No research was found on postpartum resistance exercise. Information provided regarding postpartum resistance exercise is extrapolated from limited research on pregnancy and resistance exercise. According to the literature, resistance exercise during pregnancy has been deemed safe. The assumption was made that resistance exercise during the postpartum period would also be safe because based on the established research, the physiological systems affected during pregnancy are either functioning as they did during pregnancy, are healing and resuming prepregnancy function, or are functioning again as they did prior to pregnancy.

3. No research was found on exercise adherence specifically with postpartum women. Information provided in the literature included exercise adherence issues for women of a variety of ages, but research on women of child-bearing age was primarily used in this project. There was also research on the lifestyle changes and concerns of postpartum women. These two groups of literature were combined to form a composite of what exercise adherence issues might exist for postpartum women.

Delimitations

This project included the following restrictions:

1. The manual was intended for healthy postpartum women who had received their 6 week medical clearance to resume exercise activity from their health care provider.

2. Exercises were specifically designed to be performed with healthy children under 1 year of age.

3. Songs used in the exercises were delineated to either the public domain or written by the author.

Assumptions

This project was conducted with the following assumptions:

1. As babies grow, they increase in weight. Increasing strength is required of parents to care for children as they age.

2. If resistance exercise is safe during pregnancy, then the same exercises should be safe during the postpartum period.

3. If the same barriers to exercise exist for women of child-bearing age and for postpartum women, then methods to address those barriers for women of child-bearing age may also be effective for postpartum women.

Definition of Terms

Exercise. Exercise is a "planned, structured, repetitive movement of the body designed to improve or maintain physical fitness" (Fahey, Insel, & Roth, 2001, p. 20).

Exercise adherence. Exercise adherence is the study of the "knowledge, attitudes, and behavioral and social skills associated with adopting and maintaining regular exercise" (Dishman, 1994, p. 1).

Lifestyle physical activity. Activities that increase daily energy requirements are considered lifestyle physical activities (Anderson, 1999). Physical tasks such as housework, gardening, playing with toddlers, and utilizing as few labor saving devices as possible (washing dishes by hand instead of using a dishwasher, for example) can increase daily energy requirements.

Muscular endurance. Moffatt and Cucuzzo (1993) define muscular endurance as "the ability of a muscle group to sustain repeated contractions of a given force for an extended length of time" (p. 337).

Muscular strength. Muscular strength is defined by Foss and Keteyian (1998) as "the force or tension that a muscle or group of muscles can exert against a resistance in one maximal effort" (p. 604).

Overload principle. The overload principle is "progressively increasing the volume of exercise during workouts over the course of the training program as fitness capacity improves" (Foss & Keteyian, 1998, p. 604).

Physical activity. "Any movement carried out by the skeletal muscles and requiring energy" (Fahey et al., 2001, p. 20) is considered physical activity.

Physical training. Physical training is "the performance of different types of activities that cause the body to adapt and improve its level of fitness" (Fahey et al., 2001, p. 25).

Postpartum. For the purposes of this project, the postpartum period will include the first year after delivery.

Postpartum depression (PPD). Postpartum depression is a general term used to describe a type of depression that occurs in women up to 24 months after the delivery of a child (Leopold & Zoschnick, 1997).

Progressive resistance exercise (PRE). Progressive resistance exercises "are designed to strengthen specific muscles by causing them to overcome resistances that are gradually increased over time" (Pate & Burgess, 1993, p. 573).

Importance of Project

Health Benefits for Women

The long term benefits of regular exercise for all women include reducing their risk of coronary heart disease (Manson et al., 1999; Stampfer et al., 2000), reducing their risk of stroke (Hu et al., 2000), reducing their risk of reproductive and breast cancers (Chlebowski, 2000; Tangley, & Miller, 1988), and reducing their risk of osteoporosis (Keen, 1999). There are immediate benefits to women who exercise as well. Even daily homemaking tasks can become easier when the body has strength and endurance reserves acquired through exercise. For the postpartum mother, a baby needs many hours of nursing, holding, and other caretaking activities. These activities require increasing amounts of muscular

strength and endurance as the baby grows older (Sefi, 1987; Smith, 1989). Exercise can enhance a mother's strength and teach her good lifting techniques, allowing her to care for her child without undue risk of injury.

Postpartum women can reap the benefits of regular exercise by taking advantage of the significant change in their lives and beginning an exercise program. A program can decrease their risk of developing detrimental health conditions as well as decrease their chance of injury as they perform their new parenting role.

Need for More Information on Exercise

For a group that is sure to need progressive resistance training to care for a growing infant, there has been very little research on how to prepare women prenatally or during the postpartum period to enhance muscular strength and endurance to reduce the risk of injury. The statement the American College of Obstetrics and Gynecology (ACOG) published on exercise includes very little information on postpartum exercise; most of the information relates to exercise during pregnancy (ACOG, 1994). In response to surveys on their postpartum needs, postpartum women clearly indicated they want information on exercise (verbally from health care providers as well as in printed formats) and the opportunity to include their infant in their exercise regimen (Devine et al., 2000). There are few texts on postpartum exercise, and they are primarily focused on aerobic exercise and spot reduction. A basic progressive resistance exercise manual that outlines appropriate exercise options that can be performed with an infant, and is reviewed by experts from diverse backgrounds in women's health,

would be a good start in guiding postpartum women in safely beginning or resuming a progressive resistance exercise program.

Chapter 2

LITERATURE REVIEW

In this chapter literature on the benefits and risks of postpartum exercise, the physiology of postpartum women, established resistance exercises appropriate for postpartum women, and exercise adherence are discussed. The chapter is concluded with a summary of appropriate resistance exercises and strategies to increase postpartum exercise adherence.

Potential Benefits and Risks of Postpartum Exercise

Potential Benefits of Postpartum Exercise

Many women who chose to exercise during the postpartum period do so to improve their fitness level, lose weight gained while pregnant, and to seek social support in a group setting (Clapp & Little, 1995; May, 1995; Sampselle, Seng, Yeo, Killion, & Oakley, 1999; Sefi, 1987). There are a variety of reasons that may motivate a woman to improve her fitness level. Most women tend to reduce the intensity of their exercise regimen and/or general activity level as they progress through their pregnancy (Clapp & Capeless, 1991). After delivery these women may find their fitness levels have declined from prepregnancy levels. Postpartum fatigue can be almost debilitating at times, and exercise is one way to get back some energy (Gardner & Campbell, 1991; Lovelady, Lonnerdal & Dewey, 1990). Some women, unhappy with their "new physique," find physical exercise is one way to tone newly sagging abdomens and stabilize aching backs from carrying an infant all day (Clapp & Little, 1995; Devine et al., 2000; Moran, Holt, & Martin, 1997). "Cabin fever" can drive some women out of the house, searching for something else to do other than care for a baby (Sefi,

1987). Regardless of the reason motivating the desire for fitness, cardiovascular fitness does improve significantly with regular aerobic exercise (45 minutes per session, four to five times per week at 60-70% of maximum heart rate) during the postpartum period for both sedentary and active women (Dewey, 1998b; Dewey, Lovelady, Nommsen-Rivers, McCrory, & Lonnerdal, 1994; Dewey & McCrory, 1994; Lovelady et al., 1990).

Many women exercise with the hope of losing weight they may have gained during their pregnancy, or weight they did not lose before they became pregnant. Although it seems logical that exercise would facilitate weight loss, during the early postpartum period (18 to 20 weeks) it is not the case (Butte & Hopkinson, 1998; Clapp & Capeless, 1991; Clapp & Little, 1995; Dewey, 1998a; Dewey & McCrory, 1994; Little, Clapp, & Ridzon, 1994; Lovelady et al., 1990; Schelkun, 1991). Nutrition and diet appear to have a greater effect on postpartum weight loss 6 to 18 months postpartum than exercise (Walker, 1996). However, lack of exercise 1 year after delivery may play a role in long term weight retention (Morin, Gennaro, & Fehder, 1999). Studies fail to indicate exactly when the postpartum woman's body begins to react to exercise as it did prior to pregnancy. It may be more reasonable to expect moderate weight loss by eating nutritionally balanced meals, monitoring caloric intake, and exercising regularly as a part of a comprehensive lifestyle plan. Until more research is conducted, each woman may be able to detect when more vigorous exercise appears to assist her in her body fat loss goals by monitoring her own body.

Exercise groups are a good way for mothers to gather and exchange thoughts, ideas, and information that can be helpful to one another (May, 1995;

Sampselle et al., 1999; Sefi, 1987). Early motherhood can be a trying and lonely time and many women feel ashamed to ask for help (May, 1995). Many mothers feel societal pressure to be the model of the perfect wife and mother with everything under control. New mothers may find themselves isolated from other adults and would simply like the opportunity to converse with others with similar interests (Sefi, 1987). Social support from other mothers and caring instructors can give a new mother support and a place where she can relax. She can vent her frustrations in a non-threatening environment that also gives her advice and suggestions on how to cope with her new (or renewed) roles and responsibilities if she chooses to solicit it (Clapp & Little, 1995).

One area that has received little attention in the literature is the role of exercise in reducing or alleviating postpartum depression (PPD). PPD can vary in severity from "the blues" (mild transient depression) to severe depression (Schaper, Rooney, Kay, & Silva, 1994). Exercise has been shown to reduce (and possibly prevent) varying levels of depression when done on a regular basis (Artal & Sherman, 1998). It does appear hopeful that exercise may help some cases of mild PPD (May, 1995). When a group of postpartum women exercised aerobically for 60 minutes in a one-time session, they reported a significant reduction in their current anxiety levels (state anxiety) as well as a better general mood with increased energy (Koltyn & Schultes, 1997). Exercise during pregnancy, however, does not appear to have an effect on occurrence of PPD (Stephenson, 1987).

Although there is little concrete evidence to support it, postpartum athletes have been rumored to have more "toughness" and endurance after

delivery (George & Berk, 1981). Because pregnancy itself is a training state (physiological symptoms such as increased heart rate and cardiac output are elevated throughout the entire pregnancy), it may produce changes that are advantageous to the training athlete. When Bulgarian Olympic and Masters athletes were studied a year after childbirth, 96% of athletes who returned to their sport reported feeling more physically fit, had an increase in their stamina, and thought their technical skill had improved (Zaharieva, 1972). When the results of their efforts is examined, 78% exceeded their records set before pregnancy and another 7% were able to equal their prior records. Just giving athletes a needed break from training may give them an edge after birth or the act of birth assures some female athletes of their own femininity (Sady & Carpenter, 1989). There is a statistically significant increase in VO_2 max after pregnancy in recreational and competitive athletes that cannot be explained just by training during postpartum; the increase is too rapid (Clapp & Capeless, 1991). Other physiological changes that occur during pregnancy may also enhance performance for athletes, but more information is needed to draw any firm conclusions.

In summary, the potential benefits of postpartum exercise are improved fitness level, increased energy, weight loss, social support in a group exercise setting, possible decreased intensity of PPD, and possible increased stamina for athletes.

Potential Obstacles and Risks of Postpartum Exercise

Obstacles to establishing an exercise routine exist for every person who chooses to exercise. Postpartum women have additional obstacles and risks

associated with child-bearing. Perhaps the most obvious obstacles for this group are a lack of sleep, lack of time (specifically due to the demand of childcare), and lack of competent childcare. Most new mothers experience sleep deprivation of varying degrees and when one has little energy, exercise is not usually the highest priority (Brehm, 1989; Gardner & Campbell, 1991; Moran et al., 1997). With all of the new responsibilities of caring for an infant, many mothers do not believe they have time in their day to tend to their own immediate needs, much less exercise (Artal & Buckenmeyer, 1995; Clapp & Little, 1995; Cohen, 1966; Devine et al., 2000; Findlay & Capes, 1969; Schelkun, 1991; Williams & Odoni, 1967). For those mothers determined to exercise without their babies, safe and reliable childcare is an additional obstacle (Devine et al., 2000; Moran et al., 1997).

Mothers may be embarrassed to find that after labor a simple cough or laugh may cause urinary leakage (Parsons, 1998). Urinary stress incontinence is usually caused when the pressure in the abdominal cavity rises and the pelvic floor muscles are too weak to keep the urethral sphincter closed. Although aerobic exercise might appear to exacerbate the problem, aerobic exercise in conjunction with circum vaginal muscle exercises can improve and often cure urinary incontinence due to weakened circum vaginal muscles (Kegel, 1948; Valancogne & Galaup, 1993).

For women who chose to breastfeed their children, successful lactation is a high priority. Breast milk quality and quantity are important for the growing infant's nutritional needs. Exercise (even high intensity) does not negatively interfere with lactation or infant growth in healthy women and infants (Clapp & Little, 1995; Dewey et al., 1994; Dewey & McCrory, 1994; Lovelady et al., 1990;

Sampselle et al., 1999). Regular exercise may actually benefit infants by increasing the volume and caloric content of the milk (Dewey et al., 1994; Lovelady et al., 1990; Schelkun, 1991). Mothers may be concerned that exercise will change the taste of their milk and that their infant may reject it after exercise. Concentration of lactic acid does increase in breast milk after exercise in proportion to the level of exertion; the highest levels of lactic acid are found when exercising close to VO_2 max levels (Carey, Quinn, & Goodwin, 1997; Quinn & Carey, 1999; Wallace, Inbar, & Ernsthausen, 1992; Wallace & Rabin, 1991; Wright, Carey, & Quinn, 1999). Lactic acid has a sour taste and infants can detect the flavor of sour (Wallace & Rabin, 1991). However, most infants do not appear affected by the presence of the lactic acid in post exercise milk (Dewey, 1998a; Dewey et al., 1994; Dewey & McCrory, 1994; Wright et al., 1999). For the few infants that do reject post exercise milk or suffer gastric pain after ingesting post exercise milk, pumping before exercise and feeding it to the infant after exercise or using artificial breast milk right after exercise may alleviate infant distress (Duffy, 1997; Wallace, Ernsthausen & Inbar, 1992).

A key component to breast milk is Immunoglobulin A (IgA), which aids the infant's immature digestive tract in destroying various substances that may harm them (Gregory, Wallace, Gfell, Marks, & King, 1997). Exercise reduces the concentration of IgA in breast milk for 30 minutes after exercise, however, IgA levels return to normal within 1 hour after exercise. Because of the rapid return to normal levels, infant protection is not considered compromised.

Once she begins exercising, it does not take long for the nursing mother to identify the need for adequate breast support. Because of the risk of plugged

ducts (which can lead to a painful case of mastitis) or irritating the nipples, nursing mothers need to find bras that are supportive without putting pressure on the breast tissue (Clapp & Little, 1995; Findlay & Capes, 1969; Schelkun, 1991). Wearing two cotton sport bras provide a uniform compression and allow the skin to breathe (Clapp & Little, 1995). Nursing or pumping before exercise may also decrease the amount of milk in the breasts and increase exercise comfort. However, this should not be done by mothers whose infants are sensitive to post exercise lactic acid levels in their breast milk because lactic acid levels peak more slowly and are elevated much longer in breasts emptied before exercise than breasts left full (Wallace, Ernsthausen et al., 1992). The physiological reasons for this phenomenon are not presently understood.

In summary, the potential obstacles and risks of postpartum exercise include lack of sleep (fatigue), lack of time, lack of safe and reliable childcare, urinary stress incontinence during exercise if circum vaginal muscles are weak, possible issues with breastfeeding, and obtaining adequate breast support.

Physiological Changes from Pregnancy to Postpartum

Although many physicians would consider the postpartum period to encompass the 6 to 8 weeks following delivery, not all of the physiological systems of the body recover from the adaptations to pregnancy that quickly. It is generally accepted that the hemostatic system, cardiovascular system, renal system, and gastro/intestinal system all return to their prepregnancy functioning by 6 weeks following delivery (ACOG, 1994; Blackburn & Loper, 1992; Danforth, 1967). However, some physiological changes that have been studied more closely show signs that they may not be back to prepregnancy

functioning in the 6 weeks following delivery. There may even be some pregnancy alterations that never revert to prepregnancy states.

The cardiovascular system has had more attention than other body systems in the literature and has been studied in progressively longer periods after delivery. In average exercising women, aerobic capacity is diminished after delivery (Patience, Dettori, & Hoyt, 1998). Aerobic capacity is not regained 4 to 8 weeks postpartum (when compared to prepregnancy measurements) in women who did not continue exercising throughout pregnancy and immediately after delivery (South-Paul, Rajagopal, & Tenholder, 1992). The results are not surprising and appear to reflect what would normally occur during any detraining period when exercise and activity levels decrease. However, when participants were studied 12 weeks postpartum after resuming an exercise program, aerobic capacity had not been regained and had not returned to prepregnancy levels (Capeless & Clapp, 1991; Clapp & Capeless, 1991; Pivarnik, 1996). When checked 7 months after delivery, cardiovascular test results were closer to prepregnancy levels than they had been at 2 months postpartum; however, they had not yet returned to prepregnancy values (Sady et al., 1990). As part of a formalized fitness test, postpartum soldiers performed three tests (pushups, sit-ups, and a timed 2 mile run). These women were all a part of a formal training regimen and had been in a structured training group for more than 3 months before the tests were given. Even with a structured training program, the women had not regained their prepregnant fitness levels 6 to 9 months after delivery (Patience et al., 1998). Breastfeeding appears to affect plasma volume of the blood, which may decrease the rate at which a women's

body recovers from pregnancy (Hart, Morton, Hosenpud, & Metcalfe, 1986). Women who have had more than one child have an aortic diameter that is permanently larger than both nonpregnant women and women who have had only one child (Hart et al., 1986). Changes made to the cardiovascular system may not only take more than 6 weeks to revert back to prepregnancy states, some of them may never do so.

Muscles, joints, and ligaments may need longer than 6 weeks to revert to prepregnancy form, function, and structure (Schauberger et al., 1996). Typically due to weakened abdominal muscles, lumbar lordosis (a curvature of the lower back that is associated with back pain) in the postpartum period may continue for more than 6 weeks (Otman, Beksac, & Bagoze, 1989). Relaxin is one of the hormones that cause ligaments to "loosen" during pregnancy by changing how collagen fibers are configured and allowing them to expand (Danforth, 1967; MacLennan, 1991). Joint and ligament laxity facilitate the birth of the child by allowing the baby to travel through the cervix, vagina and pelvis (Artal et al., 1989). Although relaxin dissipates quickly after delivery, recovery time from its effects varies from 6 weeks to 3 months (Artal & Buckenmeyer, 1995; Ohlin & Rossner, 1996). Its effect on connective tissues may continue as long as 5 or 6 months postpartum (Blackburn & Loper, 1992; Calguneri, Bird, & Wright, 1982; Potter & Strauss, 1997). This leaves the postpartum woman open to the possibility of more muscle, joint, and ligament injuries during the time relaxin still affects the body.

Postpartum women suffer more lower extremity pain (especially in the hip and foot) than women who have never been pregnant (Vullo, Richardson, &

Hurvitz, 1996). Approximately 50% of pregnant women suffer some lower extremity pain. Plantar faciitis may be more prevalent due to the new demands of childcare, joint laxity (due to relaxin's effects), and weight gained during pregnancy. In participants studied, their lower extremity pain did not require intensive medical treatment, but did take up to 4 months to resolve in some cases. Anyone who has ever lived with an infant will attest to the fact that walking with an infant to calm him or her can be extremely important. It can be extremely stressful to hear a baby's cries from the lack of his or her mother's movement. Exercise before and during pregnancy was neither a risk factor nor a prophylactic in the occurrence of lower extremity pain. Residual laxity from pregnancy can still be measured 6 weeks after delivery and may contribute to postpartum foot pain (Block, Hess, Timpano, & Serlo, 1985).

In summary, there are multiple physiological changes from pregnancy to postpartum. Those systems that are thought to revert to prior pregnancy function within the first 6 to 8 weeks after delivery are the hemostatic, cardiovascular, renal, and gastro/intestinal systems. The cardiovascular system, muscles, joints, and ligaments may take months to revert to prepregnancy function.

Timeframe for Resuming Exercise Postpartum

Although many of the physiological systems may take more than 6 weeks to recover from pregnancy adaptations, the type and amount of exercise deemed appropriate after delivery does contain some cultural bias. Although other cultures have women resuming normal activities relatively soon after delivery (George & Berk, 1981), Western literature tends to delineate between

activities and exercises that may be resumed immediately after delivery and activities and exercises that are appropriate 6 weeks or more after delivery. There is also a Western bias that women may not want very much information about exercise right after childbirth as they are "overwhelmed" with the new responsibilities of baby care (Williams & Odoni, 1967).

Most postpartum women are advised to resume "normal activities" (including exercise) 3 to 6 weeks after their child's birth (George & Berk, 1981; Stover & Marnejon, 1995). If a woman has any concern about when to resume exercise, the most conservative advice is to speak to a physician or someone trained in understanding the potential risks with postpartum exercise prescription (Artal et al., 1989; Ohlin & Rossner, 1996). However, it is generally accepted that a healthy woman with an uncomplicated vaginal birth can safely begin some forms of resistance exercise immediately after delivery (Stover & Marnejon, 1995). Realistic goals should be set for cosmetic expectations of the results of early resistance exercise, but there are other benefits to beginning them soon after delivery (Ohlin & Rossner, 1996). The faster exercise resumes after tissue injury has occurred, the less muscle atrophy will occur and the sooner normal function will resume (Kegel, 1948). Exercises should be done slowly and deliberately, paying attention to technique so that they are done correctly and do not cause further injury to strained muscles and tissues (ACOG, 1994; Stover & Marnejon, 1995). As muscles may tire easily in the beginning, it is recommended that exercises be performed with fewer repetitions, yet frequently throughout the day (Findlay & Capes, 1969). It is important to do them often, both to

improve muscle strength and tone, as well as forming a healthy lifelong habit (Findlay & Capes, 1969; Kegel, 1948).

Exercises for the Postpartum Period

Exercises for Immediately After Delivery

There are three primary areas that are currently emphasized when exercising immediately postpartum, including the pelvic floor, abdomen, and the back (Cohen, 1966; Findlay & Capes, 1969; George & Berk, 1981; Ketter & Shelton, 1983; Noble, 1995; Ohlin & Rossner, 1996; Stover & Marnejon, 1995; Williams & Odoni, 1967). Other areas emphasized in the literature used to include exercises for the ankles, for the gluteals, and for deep breathing (Cohen, 1966; Findlay & Capes, 1969; Williams & Odoni, 1967). However, now that women are out of bed within a few hours after delivery and/or surgery, these types of exercise are no longer needed (Blackburn & Loper, 1992).

In 1948 Dr. Arnold Kegel identified a method of exercising the pelvic floor muscles (today referred to as "kegels") that allows the perineum to become stronger and even reduces urinary incontinence due to weakened perineal muscles (Kegel, 1948). Based on the "use it or lose it" premise, he describes an exercise where a woman contracts the muscles of the vagina in order to strengthen them. (Dr. Kegel emphasized the importance of exercise that a person completes by his or her own efforts; passive exercise does not improve muscle function.) Improvement in muscle strength typically occurred within 20-40 hours of progressive resistance exercise (progressively squeezing the muscles harder) spread out over 20 to 60 days.

Immediately after childbirth, the two most vulnerable areas to injury are the abdomen and back (May, 1995). The rectus abdominis muscle can be especially vulnerable if it has a diastisis (a splitting of the muscle along its longitudinal center). A diastisis tends to occur as the pregnant uterus stretches the abdominal muscles, however, different women may have more or less separation due to physiological differences of their own bodies (DiFiore & Gaskell, 1993). It is fairly simple to check for this diastisis and either a health care provider or the woman herself can check to see if this condition exists (Noble, 1995). If it does, exercising the abdominal muscles while holding them together can close the diastisis. It is important that abdominal exercises be done carefully until the diastisis has been closed, otherwise injury to the rectus abdominis muscle could result (DiFiore & Gaskell, 1993; Noble, 1995). Once the diastisis has been closed, abdominal crunches can be done to increase abdominal muscle strength and tone and decrease abdominal circumference (Cohen, 1966). Within 24 hours of delivery, pelvic tilts can be started to strengthen abdominals (DiFiore & Gaskell, 1993; Findlay & Capes, 1969; Otman et al., 1989).

The mother's body may not immediately nor automatically resume good posture after compensating for the forward shift in weight and center of gravity of the pregnant uterus (Viadero, 1988). To compound posture problems, baby care can exceed the amount weakened abdominal and back muscles can handle, causing pain in the low back, shoulder blades, and neck (Viadero, 1988; Williams & Odoni, 1967). Varying degrees of lumbar lordosis continue to exist 6 weeks postpartum whether or not exercises to strengthen abdominals are performed. However, isometric exercises to strengthen abdominal muscles can reduce low

back pain (Otman et al., 1989). Although pelvic tilts are recommended for strengthening abdominals, they may also relieve low back pain by aiding the return of good posture (DiFiore & Gaskell, 1993; Findlay & Capes, 1969).

In summary, exercises appropriate for immediately after delivery include exercises for the pelvic floor (perineum), the abdomen, and the back. Exercises must be resumed slowly and attention should be paid to exercise technique to avoid injury.

Exercises for 6 Weeks After Delivery and Beyond

Because different systems in the body recover from pregnancy and delivery at different speeds, what types of exercise undertaken and how soon are a matter of what body area is being exercised. There is no consensus on when the postpartum woman's body has "recovered" from pregnancy and birth. The amount of time a woman is asked to wait to resume exercise varies by how her delivery went and her general state of health (Blackburn & Loper, 1992). Even with this guidance, pain from episiotomy, cesarean surgery, joint laxity, back pain, and abdominal diastisis may linger for weeks and even months. There is consensus that whenever the woman begins exercising that she starts slowly (ACOG, 1994). Variables such as birth complications and prior exercise history can affect how soon and how vigorously exercise may be resumed (Blackburn & Loper, 1992).

Aerobic exercise is the most studied type of exercise for postpartum women (Dewey & McCrory, 1994). Safe and effective forms of aerobic exercise include walking and running (Artal et al., 1989; Capeless & Clapp, 1989; Uzendoski, Latin, Berg & Moshier, 1990; Van Raaij, Schonk, Vermaat-Miedema,

Peek, & Hautvast, 1990); cycling (Artal et al., 1989; Jaque-Fortunato, Wiswell, Khodiguian, & Artal, 1996; Lotgering, Spinnewijn, Struijk, Boomsma, & Wallenburg, 1998; Pernoll, Metcalfe, Kovach, Wachtel, & Dunham, 1975; Sady & Carpenter, 1989; South-Paul et al., 1992); aerobic classes (Bonen, Campagna, & Beresford, 1995; Koltyn & Schultes, 1997; May, 1995; Patience et al., 1998; Sefi, 1987); and swimming (Spinnewijn, Wallenburg, Struijk, & Lotgering, 1996). Although pregnancy itself is a training state (George & Berk, 1981), anytime there has been a decline in physical activity, resumption of that activity should begin slowly and consistently (ACOG, 1994).

There have been no studies specifically on the effects of resistance exercise within the first year after delivery. However, it may be assumed that since resistance exercise at moderate levels is found acceptable during pregnancy, it is safe during the postpartum period (Artal & Buckenmeyer, 1995; Ohlin & Rossner, 1996). Heavy free weights should be avoided as muskuloskeletal changes may persist for an extended period of time after delivery (see discussion of physical changes from pregnancy to postpartum for more details). Resistance exercise should be performed at a moderate pace and close attention should be paid to form in order to best work the muscle without becoming injured (DiFiore & Gaskell, 1993). Isometric exercise is an effective and convenient way to begin exercising postpartum (Otman et al., 1989). It does not require equipment and can be performed at home while caring for children.

Due to the new strain to the back and neck muscles from breastfeeding and/or bottle feeding, carrying and cuddling an infant, and stress from adjustment to a new role, the new mother has particular requirements for

stretching that include the chest, shoulders, neck and back (Ohlin & Rossner, 1996). Because there are mixed reports of when the effects of relaxin disappear after delivery, any stretches that put undue strain on joints, ligaments, or muscles should be avoided. One advantage to stretching is that it is easy to perform at home on the floor, allowing moms to be close to care for their babies (Sefi, 1987).

In summary, exercises appropriate for beyond 6 weeks after delivery include aerobic exercise (walking, running, cycling, aerobic classes, and swimming), moderate resistance exercise, and stretching. As noted previously, exercises should begin slowly and attention paid to technique to avoid injury, especially to the areas that may not have reverted to prepregnancy function: the cardiovascular system, muscles, joints, and ligaments. Because of the possibility of injury, it would be prudent to avoid exercises that put undue stress on these areas or that were controversial in nature.

Exercise Adherence

General Exercise Adherence

Although the benefits of exercise to a healthy lifestyle have been established (Caspersen, Powell, & Christenson, 1985), the adoption of exercise into the American lifestyle has not yet occurred in most of the healthy adult population. Approximately 20% of the normal population exercises with enough regularity to achieve optimal health benefits (Dubbert, 1992). For those people who actually go out and begin an exercise program, an average of 50% will drop out of the program within the first 6 months of starting it (Dishman, 1986; Oldridge, 1984). However, Dishman and Oldridge's adherence data was

compiled by primarily studying men. Few exercise adherence studies have been conducted on only female participants (Gale, Eckhoff, Mogel, & Rodnick, 1984; Godin et al., 1994; Johnson & Heller, 1998; Kendzierski & Johnson, 1993) and no studies were found on exercise adherence for postpartum women. Dishman (1994) has pointed out that most special populations have not been studied and that those studies that have been conducted may not necessarily be generalized to special populations. At this point in time, however, there is an assumption in the literature that the 50% drop out rate applies to women as well.

Although there were no studies on postpartum exercise adherence, there was one study on postpartum smoking cessation. Since the percentage of persons who drop out of an exercise program is similar to the percentage of persons who drop out of other programs promoting healthy behaviors (such as smoking cessation, combating alcoholism, and combating other types of drug dependency) a study on postpartum smoking cessation may offer some insight into postpartum exercise adherence rates (Dishman, 1981). Mullen, Quinn, and Ershoff (1990) conducted a study on the number of women who had stopped smoking during pregnancy and had remained non-smokers postpartum. At 6 months after delivery, all study participants were contacted and blood test results confirmed via laboratory testing. Only 37% of those who had quit smoking during pregnancy had remained non-smokers 6 months after their child was born. Sadly, this statistic is even worse than the 50% adherence Dishman had predicted, with negative health consequences not only for the mother, but for her family as well. This also points to a startling possibility that

postpartum women may have a lower adherence to exercise than populations previously studied.

Exercise Adherence Barriers

With so many people dropping out of exercise programs, there are many different theories, from psychological to biological, trying to explain why people do not continue what they had started. No one factor has been found that predicts who will continue an exercise program and who will not (Dishman, 1994). As with any complex behavior issue, there appears that there may be different answers for different people to the exercise adherence mystery (Gale et al., 1984).

When surveyed about their new lifestyle adjustments, postpartum women had concerns such as a lack of sleep (fatigue), lack of time, need for social support, conflicts between family and their own needs, and return of their prepregnancy figure (Devine et al., 2000; Gjerdingen & Chaloner, 1994; Gruis, 1977; Smith, 1989). Smith studied the most prevalent concerns of primiparae (a woman who has had just one child) and multiparae (a woman who has had more than one child) women. Two of the top concerns from both groups were fatigue and regulating the demands of the family. Gardner and Campbell (1991) reviewed fatigue levels of new mothers up to 6 weeks postpartum and found it to be an extremely common concern that was not always detected by health care providers. Troy, Dalgas-Pelish, and Vichitsukon (1997) found fatigue was one of the highest concerns of first time mothers for the first 6 months postpartum.

One of the most discussed barriers in current adherence literature is the perceived lack of time for exercise (Andrew et al., 1981; DuCharme & Brawley,

1995; Godin et al., 1989; Godin et al., 1994; Harrington, 1991; Johnson, Corrigan, Dubbert, & Gramling, 1990; Johnson & Heller, 1998; Klonoff, Annechild, & Landrine, 1994; Leddy, 1997; Sutherland & Cooper, 1990; Voaklander & Brison, 1991). Leddy conducted adherence research with women who had a history of breast cancer. Through structured interviews and questionnaires she found the primary barriers to exercise were lack of time and inertia. When Klonoff et al. asked a group of women participating in a free aerobic exercise class their primary perceived barriers to exercise, the majority indicated that a lack of time or a lack of money had hindered their pursuit of exercise. A group of cardiac rehabilitation patients indicated lack of time and lack of enjoyment were barriers to continuing exercise (Johnson & Heller, 1998). It may be misleading to take the lack of time as a barrier without delving deeper into just what "lack of time" may really indicate. In a study conducted by McCready and Long (1985), they found that the percent of leisure time available to a person was unrelated to their exercise adherence. Obviously, more work needs to be done in this area.

Working women in our society face not only stressful jobs, but also an imbalance in their domestic duties. While many people come home from work exhausted, many women are expected to cook dinner, do laundry, and care for children (Hewitt, 1993). This imbalance of household tasks has a profound affect on women's leisure time. Instead of taking time for themselves, women tend to spend their "free time" on home centered activities (Harrington, 1991; Voaklander & Brison, 1991). Harrington conducted a survey of three occupational groups (university professors, nurses, and administrative assistants) to try and find out what these women were doing in their leisure time. She

found even though each of these women had different job duties and responsibilities, the three groups had common leisure time obligations of primary household chores. Gjerdingen and Chaloner (1994) conducted a longitudinal study of working women during their first postpartum year. Women were asked to complete a questionnaire five times during their first postpartum year to ascertain the current status of household roles and division of labor. During the course of the year mothers found themselves not only the primary caregiver to their child, but also taking over the majority of the household tasks. Mothers also believed that over the year since their child's birth, their husbands had reduced their help with household chores and friends and relatives had reduced their emotional and task-oriented support. However, the women were more likely to be satisfied with the amount of help they were receiving from their husbands when the women received emotional support and care from them. It appears that these postpartum women believe their leisure time is consumed with progressively more household chores with progressively less physical and emotional support.

According to Duncan, Duncan, and McAuley (1993), men and women need different kinds of support. Females tend to need more emotional support and according to their research, this type of support allows them to better deal with stress. The pairing of exercise and socializing may be a great way for women to combat the stresses of the demands of motherhood. Dishman (1994) found that social support was one of the predictors of continued activity. Erickson and Gillespie (2000) discovered conflicts with family needs, time demands, and lack of support were a perfect recipe for non-adherence. In their

study of the reasons women stopped participating in an organized fitness program, they found that the majority of those who dropped out of the class were mothers with young children. When the researchers conducted follow up interviews with participants that had dropped out of the exercise program, the participants reported they had "busy schedules, few resources (financial or emotional) and needed extra support to find a way to fit exercise into their daily lives" (p. 5). If her husband or partner is not actively supportive of her pursuit of exercise, a mother may have to try and find competent childcare outside the home (Devine et al., 2000).

McCready and Long (1985) determined the benefit of stress management was a better predictor of exercise adherence than social support. They also found factors such as percent of leisure time, family support, and previous individual exercise behaviors did not relate to current exercise practices. In a study of both men and women, Gale et al. (1984) ascertained 62% of those who dropped out of an exercise class were predominantly single men with no children. They also found no strong correlation between number of children at home and exercise adherence of women. It may be that there are different factors that are more important at different times in a woman's life. It is also interesting to note that worksite social support (fellow employees) does not appear to help adherence to exercise for either men or women (Terborg, Hibbard, & Glasgow, 1995).

In summary, exercise adherence barriers for postpartum women include lack of sleep (fatigue), lack of time, imbalance in domestic responsibilities, and

the need for social support. These barriers are based on postpartum concerns of mothers as well as current literature on barriers to women of child-bearing ages.

Other Factors of Exercise Adherence

Interestingly, concern for personal safety does not appear to be in the current literature. This is especially surprising when safety issues for women are a serious concern in today's society. It is one thing to risk one's own safety to go on a run outdoors, but quite another to risk both one's safety and the safety of one's child. The safety risk is associated with the actual type of exercise chosen by the individuals. These would obviously vary depending on the type and location of the activity conducted.

A particularly high level of interest of postpartum women (and the focus of this project) is their concern about the return of their prepregnancy figure and desire to learn more information on exercise (Becker, 1980; Devine et al., 2000; Gruis, 1977; Moran et al., 1997; Smith, 1989). Moran et al. found that after childbirth women wanted to know more information on exercise, as well as diet and nutrition. In Gruis' study of postpartum women, 95% of the respondents indicated that return of their prepregnancy figure was a concern. Gruis also pointed out that although nurses teach about postpartum infant care, they might not address how a mother can go about regaining her prepregnancy shape. Two-thirds of the women surveyed also wanted specific information on diet and exercise, but were reluctant to seek out information from busy health care providers. Devine et al. noted women not only wanted information on exercise, but they wanted to be able to include their infant in their exercise program. The authors indicated incorporating more activities into mother's daily lives would

be a way to increase activity in an already busy schedule. Becker recommended that printed matter or guides could better give mothers the information they wanted as well as giving health care providers a consistent source for teaching.

In summary, postpartum women desire more information on exercise and diet provided in both verbal discussion with health care providers and in written formats (such as flyers and pamphlets). These tools may enhance knowledge and in turn increase the possibility of a mother trying an exercise program.

Methods for Improving Exercise Adherence

Various recommendations have been made to address the barriers to exercise adherence. Franklin (p. 237, 1988) outlined 10 characteristics of exercise programs that are positively associated with adherence:

> Low probability of injury (low-impact, low-to-moderate intensity, shorter duration)
> Group participation
> Emphasis on variety and fun (games used as a proxy for exercise)
> Use of personal goals and contracts
> Assessment of training response
> Support network (friends, family, spouse)
> Monitoring of progress
> Use of music
> Positive feedback
> Enthusiastic leadership and role models

The use of these characteristics in combination increases the likelihood of adherence to exercise programs.

To address the issue of lack of time for exercise, home-based training programs and lifestyle physical activity have been suggested by the literature (Anderson, 1999; Dunn et al., 1999; King, Haskell, Taylor, Kraemer, & Debusk,

1991; Perri, Martin, Leermakers, Sears, & Noteloviz 1997; Young & King, 1995). Young and King reviewed several studies using home-based exercise programs and found them to be a viable alternative to class-based exercise programs in producing gains in physical fitness. In examining the effects of two different settings (home and group) for aerobic exercise, Perri et al. found 12 months after the programs had started, the home-based exercise program had higher exercise participation than the group based exercise program. Additionally, 15 months after the program had started the home-based exercise program had significantly greater weight loss than the group based exercise program. In their study on home and group based exercise programs for older persons, King et al. found the home exercise program was just as effective as the group based exercise program in significantly increasing VO_2 max and duration of time on treadmill testing. However, they did not find a difference in blood pressure, cholesterol levels, body weight, and body composition between the exercise and control groups at either 6 or 12 months after the activity had begun. This may be an artifact of the difference in ages and exercise intensity between this study's participants and Perri et al.'s study participants. King et al. (1992) also point out that there has been limited study on whether participants of an exercise program adhere to their exercise program in non-supervised settings.

Lifestyle physical activity gives those who have busy schedules a way to increase their daily physical activity (Anderson, 1999). Since lifestyle physical activities tend to be more convenient than structured programs, they may be a good introduction to more regular exercise at some point in the future. In their research on lifestyle and structured interventions for increasing physical activity

and aerobic fitness, Dunn et al. (1999) found lifestyle physical activity will even increase aerobic fitness and improve blood pressure in previously sedentary adults. Because it tends to be a more moderate form of activity, lifestyle physical activity has also been suggested as a good starting point for people just beginning to exercise (Anderson, 1999; Dunn et al., 1999; Young & King, 1995).

In summary, methods for improving exercise adherence include incorporating some of the 10 characteristics Franklin (1988) outlined (emphasis on variety and fun, use of personal goals and contracts, assessment of training response, and use of music, for example), creating home-based exercise programs, and increasing lifestyle physical activities. Adherence methods should be chosen based on what is appropriate for the exercise program and the individual's exercise requirements.

Chapter 3

METHODS

The purpose of the project was to create a progressive resistance program of exercises for postpartum women. The exercise program was in the form of a manual with text describing each exercise and photographs illustrating proper exercise technique. This chapter describes the manner in which the manual was produced.

Phases of Project

The production of the manual was divided into seven phases: literature review, resistance exercise program text, creative exercise adaptation, composition of exercise manual, expert critique of the manual, data analysis, and project report composition.

Literature Review

Research was synthesized from a variety of topics to obtain information relevant to creating a postpartum progressive resistance exercise program. Topics included women and exercise, exercise adherence of women, postpartum lifestyle changes, physiological changes during pregnancy and postpartum, lactation and exercise, pregnancy and resistance exercise, and postpartum exercise. A resistance exercise program that reflected current knowledge in these areas was created to answer questions about the benefits and risks of exercise for postpartum women, when to begin or resume exercising, appropriate resistance exercises, and methods for increasing exercise adherence.

Resistance Exercise Program Text

A basic review of exercise guidelines is included along with the resistance exercise program. Subjects covered include the ACSM's guidelines for exercise; the FITT principle (Frequency, Intensity, Time, and Type); resistance exercise technique; retention of strength; the BORG Perceived Exertion Scale; delayed onset muscle soreness (DOMS) and injury prevention; and definitions of strength, endurance, volume, intensity, power, concentric, eccentric, stretching, warm-up, and cool down, as they relate to resistance exercise. There is a page for outlining a fitness goal and contract to increase exercise adherence, and an exercise log to track progress in strength and endurance.

The manual outlines stretching and resistance exercises with written descriptions and photographs, names of muscles exercised, how to approximate an appropriate weight for each exercise, suggestions for appropriate objects to use as weights during each exercise, and a guideline for the number of repetitions. The exercises and photographs were developed in consultation with a biomechanist.

Creative Exercise Adaptation

To increase exercise adherence, the program created resistance exercises that were also games to play with an infant or child less than 1 year of age. This enabled mothers to exercise as well as spend valuable play time with their children. An example of an adapted exercise can be demonstrated using the song The Noble Duke of York. As shown in Figure 1, a child is placed on the mother's outstretched legs. The mother sings the words, "Oh, the noble Duke of York, he had ten thousand men. He marched them up to the top of the hill and

marched them down again." As she sings, "marched them up to the top of the hill," she pulls her knees toward her chest (Figure 2). She lowers her legs as she sings, "marched them down again" (Figure 1).

Figure 1. Start and end position for exercise

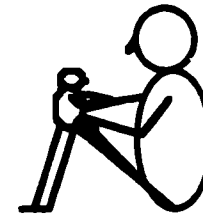


Figure 2. Mid position for exercise

Composition of Exercise Manual

Photography equipment and processing. An Asahi Pentax K1000 35 mm camera with a SMC Pentax-A 1:2 50mm lens, standard tripod, and 3 foot cable release was used to take the photographs. The black and white photographs were taken using Kodak Plus-X pan 125 PX 135-36 black and white film. Uncut negatives were processed using standard black and white film processing at Calypso Color Labs in Santa Clara, CA. Negatives were scanned in high resolution onto Kodak Multi-Session Photo CD ROMs at Wolf Camera and Video in Dublin, CA.

Photography method. Volunteer models (mother and baby pairs) were recruited from the Livermore Moms Group, the Livermore Area Recreation and Parks District Mommy and Me Group, and the Valley Care Hospital New Mothers Group. A consent form (Appendix B) to participate in the project and a model release (Appendix C) were signed before participants were photographed. Four mother and baby pairs were photographed by the author.

They were photographed outside in the shade using ambient light. Models wore simple, medium mono-color shirt and pants that were comfortable for exercise. Footwear was appropriate for warm up and cool down exercises.

Computer hardware and software. The text was created and photographs were edited using a Power Macintosh 6500/275 computer, running a complete Easy Install of System 9.1. The computer had 67 MB RAM, a 2 GB hard drive, and Zip drive with seven 100 MB cartridges. The text was created in Microsoft® Word 2001 for the Power Macintosh. The photos from the Kodak Multi-Session Photo CD ROMs were edited with Adobe Photoshop® 5.0 LE (Power Macintosh version). The text and photographs were combined in Adobe PageMaker® 6.5 Plus (Power Macintosh version). The final document was output from a Zip Drive connected to an iMac™ computer, running a complete Easy Install of system 9.1. The iMac™ transmitted the information over T1 lines to a Xerox DocuColor 12, 600 dpi printer via a Fiery Server at Kinko's Copies in Livermore, CA.

Printing and packaging. The manual was printed on white, 24 pound standard stock, 8.5 inch by 11 inch paper, and spiral bound at the left edge. The manual was printed on both sides of the paper; however, each chapter began on the right hand page for ease of locating chapter divisions. All pages had running header indicating the current page number, current chapter title, and current subheading of chapter. A 12 point font size was used as the minimum text size to facilitate ease of reading. A sans-serif font was used for chapter titles and headings, and a serif font was used for all other text (Williams, 1990a, 1990b, 1994).

Expert Critique of Manual

Two experts from each of five disciplines (n=10) were asked to critique the manual contents. Experts in obstetrics, early childhood development, exercise physiology, and exercise biomechanics were defined as those persons who had received a postgraduate degree in their respective fields. Postpartum mother experts were those mothers who had birthed at least one child and whose youngest child was currently under 1 year of age. A cover letter requesting participation in a review of research (Appendix D) and an agreement to participate in review of research (Appendix E) were sent to each participant. Experts from obstetrics, early childhood development, exercise physiology, and exercise biomechanics used the Manual Evaluation survey (Appendix F). Two postpartum mothers recruited from the Livermore Moms Club who did not participate in the photography of the manual were asked to critique the manual contents using the Mother's Evaluation survey (Appendix G).

Data Analysis

The Manual Evaluation and Mother's Evaluation surveys consisted of questions about the manual and asked for responses using a four point Likert-type scale. The four point scale was used to indicate whether the evaluator 1 (*strongly agreed*), 2 (*agreed*), 3 (*disagreed*), or 4 (*strongly disagreed*) with each statement. If an evaluator was unable to rate any of the statements, a "NA" could be circled. Evaluators were encouraged to include any comments, suggestions, or explanations regarding their responses.

A summary table of responses to both questionnaires was compiled listing each question number, the total number of reviewers, the answer each

indicated (1 [*strongly agreed*], 2 [*agreed*], 3 [*disagreed*], 4 [*strongly disagreed*] or NA), and the percentage of respondents who indicated each answer. A detailed analysis table of each question on both questionnaires is provided. Each table included the question asked on the survey, the total number of reviewers who answered the question, and the answer each indicated. Representative comments written in the comments section of the questionnaire as well as a brief discussion of the comments are included after each table.

The data analysis of the questionnaires is included in chapter 4 of the project report.

Project Report Composition

The final composition of the project is in project report form. It includes an introduction (chapter 1), a literature review (chapter 2), methods (chapter 3), results (chapter 4), conclusions (chapter 5), references, and appendices (including the completed postpartum progressive resistance exercise manual).

Chapter 4

RESULTS AND DISCUSSION

The purpose of the project was to create a progressive resistance program of exercises for postpartum women. The exercise program is in the form of a manual with text describing each exercise and photographs illustrating proper exercise technique.

General Procedure Followed

After approval was received from the Human Subjects Review Board of San Jose State University, 10 manuals were sent out to 10 evaluators. Each manual was sent with a cover letter, consent form, questionnaire, and two self-addressed stamped envelopes. Experts (n=8) were sent the Manual Evaluation Questionnaire and mothers (n=2) were sent the Mother Evaluation Questionnaire. Reminder post cards were sent approximately 2 weeks after the initial mailing of the survey to those evaluators who had not yet sent in a consent form. Reminder E-mails and phone calls were conducted approximately 4 weeks after the initial mailing to those evaluators who had not yet sent in a consent form. Of the 10 questionnaires sent out, only six were returned (a 60% return rate). All six were complete and used in the analysis. See Table 1 for results of which reviewers returned the questionnaire.

TABLE 1

Reviewer Response Rate to Mailed Questionnaires

Field of Expertise	Number Mailed	Number Returned
Biomechanics	2	1
Early Child Development	2	1
Obstetrics	2	2
Pediatrics	2	0
Motherhood	2	2

The two surveys contained 13 questions that were identical. (Question numbers for both surveys are noted on the detailed question discussions that follow.) Because there were some differences in the frame of reference of the two reviewing groups, some questions were different on the surveys. Questions 1, 2, 13, and 14 in the Manual Evaluation Survey were not included in the Mother Evaluation Survey. Questions 1, 9, 13, and 14 in the Mother Evaluation Survey were not included in the Manual Evaluation Survey.

Questions 1 through 13 on the Manual Evaluation Questionnaire and questions 1 through 14 on the Mother Evaluation Questionnaire used Likert scales indicating 1 (*strongly agree*), 2 (*agree*), 3 (*disagree*), or 4 (*strongly disagree*) with each statement. If an evaluator was unable to rate any of the statements, a "NA" could be circled. Evaluators were encouraged to include any comments, suggestions, or explanations regarding their responses. Question 14 on the Manual Evaluation Questionnaire also used a Likert scale, but its values consisted of 1 (*all*), 2 (*most*), (3 (*some*), or 4 (*no, none*) in reference to the question. Questions

15 through 17 on both questionnaires allowed for comments on specific aspects of the manual.

The scores for each question were summed, and percentages of responses for each answer were calculated. The responses for questions 1 through 13 on the Manual Evaluation Survey are summarized in Table 2. (Due to the use of a different scale, question 14 results on the Manual Evaluation Survey are included in the analysis of the individual question that follows the tables.) The responses for questions 1 through 14 on the Mother Evaluation Survey are summarized on Table 3. Individual question comments and discussions for both surveys follow the tables.

Detailed Analysis of Questionnaires

Summaries of Responses

The summary of responses for all scored questions for each survey is listed below in Table 2 and Table 3.

TABLE 2

Responses to Manual Evaluation Questionnaire (n=4)

Question	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
1. The language is appropriate for the target audience.	3 (75%)	1 (25%)	0	0	0
2. The language used is the manual is clear.	2 (50%)	2 (50%)	0	0	0
3. The manual is easy to read.	3 (75%)	1 (25%)	0	0	0
4. The manual holds the reader's attention.	1 (25%)	3 (75%)	0	0	0
5. The layout of the manual allows ease of access to information.	3 (75%)	1 (25%)	0	0	0
6. The manual is organized and clear.	2 (50%)	2 (50%)	0	0	0
7. The titles of the subheadings are easily understood.	2 (50%)	2 (50%)	0	0	0
8. The photographs effectively clarify text descriptions of exercises presented in the manual.	2 (50%)	2 (50%)	0	0	0
9. An adequate number of photographs are included in the manual.	3 (75%)	1 (25%)	0	0	0
10. Techniques for performing exercises are easy to understand.	2 (50%)	2 (50%)	0	0	0
11. Descriptions of exercises provide adequate information for performing the exercises.	2 (50%)	2 (50%)	0	0	0
12. The manual adequately covers the topic of post-partum resistance exercise.	2 (50%)	1 (25%)	0	0	1 (25%)
13. I would feel comfortable referring postpartum women to this manual as a source of information on resistance exercise.	3 (75%)	1 (25%)	0	0	0

TABLE 3

Responses to Mother Evaluation Questionnaire (n=2)

Question	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
1. The manual covers the information I expected.	1 (50%)	1 (50%)	0	0	0
2. The manual is easy to read.	2 (100%)	0	0	0	0
3. The manual holds my attention.	1 (50%)	1 (50%)	0	0	0
4. The layout of the manual allows ease of access to information.	2 (100%)	0	0	0	0
5. The manual is organized in a logical manner.	1 (50%)	1 (50%)	0	0	0
6. The titles of the subheadings are easily understood.	2 (100%)	0	0	0	0
7. The photographs effectively clarify text descriptions of exercises presented in the manual.	2 (100%)	0	0	0	0
8. An adequate number of photographs are included in the manual.	1 (50%)	1 (50%)	0	0	0
9. The photographs provide realistic expectations of the exercises.	2 (100%)	0	0	0	0
10. Techniques for performing exercises are easy to understand.	2 (100%)	0	0	0	0
11. Descriptions of exercises provide adequate information for performing the exercises.	2 (100%)	0	0	0	0
12. The manual adequately covers the topic of post-partum resistance exercise.	2 (100%)	0	0	0	0
13. Exercises appear appropriate for play with my child.	2 (100%)	0	0	0	0
14. I would try the exercise program outlined in the manual if it were made available to me.	2 (100%)	0	0	0	0

Analysis of Each Individual Question

Each question from the Manual Evaluation Questionnaire and Mother Evaluation Questionnaire was analyzed based on the information provided in Table 2 and Table 3. The analysis includes the question used in the survey, representative comments, and discussion of the comments.

Manual Evaluation Question 1

The language in the manual is appropriate for the target audience.

Representative Comments. "Some aspects may be too technical."

"For the most part the language is appropriate for a group of well educated women who are already interested and to some degree committed to doing exercise. I think they would also need to some degree to be knowledgeable about resistance exercise."

"A few words/terms used that most lay people will not know; e.g. biomechanist, one rep max, state anxiety."

Discussion. The reviewers agreed that the language used in the manual was appropriate for the target audience; however, their comments reflected a concern that some of the "technical" terminology could be unfamiliar to the target audience.

Manual Evaluation Question 2

The language used in the manual is clear.

There were no comments made by reviewers on this question.

Manual Evaluation Question 3

The manual is easy to read. (Corresponds to question 2 on Mother Evaluation Questionnaire.)

Discussion. Most of the reviewers believed that the manual was easy to read. There was some concern, however, that the formatting of one of the more complex chapters could make the reading difficult for the target audience. One reviewer pointed out, "The text of chapters 1 and 2 have so much source documentation that it makes the reading seem at times cumbersome. It seems that chapter 2 has many paragraphs that are especially long."

Manual Evaluation Question 4

The manual holds the reader's attention. (Corresponds to question 3 on Mother Evaluation Questionnaire.)

Discussion. There appeared to be a bias on the part of the reviewers toward the type of research citing style each was familiar with in determining the accessibility of the material to the reader. This was also the only question in which the majority of the reviewers answered "agree" more than "strongly agree." Although one reviewer praised the writing by commenting, "nice job with this, " another reviewer noted, " I just got lost in my thoughts at the chapter on relevant research. Perhaps putting footnotes would have been better." The second comment may also indicate that the reviewers were less familiar with reading the American Psychological Association (APA) style of writing and citing sources. Overall, however, it was thought that the manual did hold the reader's attention.

Manual Evaluation Question 5

The layout of the manual allows ease of access to information. (Corresponds to question 4 on Mother Evaluation Questionnaire.)

Discussion. The majority of the reviewers thought the manual layout allowed easy access to the information. "It is nice to have both the formal muscle name and location on the pages," wrote one reviewer. However, there was a question on where to find information on planning and incorporating different types of exercise together. As another reviewer explained, "I was somewhat unclear about how to incorporate aerobic with resistance training from a weekly planning point of view."

Manual Evaluation Question 6

The manual is organized in a logical manner. (Corresponds to question 5 on Mother Evaluation Questionnaire.)

Representative Comments. "I really like your organization. Very clear!"

"Describe resistance exercise earlier."

"The manual is organized in a logical manner from the perspective of a researcher. From the perspective of a woman who has recently had a baby and is anxious to get back her figure and/or her fitness routine, it may have too much information in the first part (chapters 1 and 2). Such a woman may turn immediately to the exercises and begin."

"Aerobic training didn't seem to carry as much weight as resistance-perhaps by design, but manual felt slightly unbalanced in this way."

Discussion. The suggestions of the reviewers pointed to a bias of the author to use a more research oriented writing style rather than a style that might be more appropriate to the target audience. The reviewers did indicate that the manual was logical, but perhaps should be organized so that the

material the postpartum mothers are most likely to want to read first (how to do the exercises) is more toward the beginning of the manual.

Manual Evaluation Question 7

The titles of the subheadings are easily understood. (Corresponds to question 6 on Mother Evaluation Questionnaire.)

There were no comments made by reviewers on this question.

Manual Evaluation Question 8

The photographs effectively clarify text descriptions of exercises presented in the manual. (Corresponds to question 7 on Mother Evaluation Questionnaire.)

Representative Comments. "Excellent- Babies seem happy, too!"

"I think the photographs are fine and show typical women in common casual clothes, not the body-beautiful types with whom a new mother could not relate."

"I was very impressed with how much the photos helped. I found this format much more user-friendly than video or even personal trainer/coach style because it's easer to work independently and [I] can quickly find examples of how to perform exercises without having to fast forward or rewind!"

"It may be useful to have pictures of exercises with weights in addition to children for exercises that allow adaptation- like flying feet exercise."

Discussion. There was a strong positive reaction from the reviewers that the photographs were an asset to the manual. It was gratifying to find that three of the reviewers noted and appreciated the use of models that were "normal" looking, with bodies that a postpartum woman could relate to. If additional

photographs were provided in the manual, it was suggested they could include some of the optional weights that may be used (instead of the child's weight) to perform the exercise.

Manual Evaluation Question 9

An adequate number of photographs are included in the manual. (Corresponds to question 8 on Mother Evaluation Questionnaire.)

Discussion. The reviewers responded very favorably to the use of "everyday moms" as models in the photographs. "It was nice to see `regular' moms with babies instead of unrealistic 'perfect' models," noted one reviewer. Another reviewer commented similarly that, "it is also nice to see different and realistic body types performing exercises- `new mommy figures.'"

Manual Evaluation Question 10

Techniques for performing exercises are easy to understand. (Corresponds to question 10 on Mother Evaluation Questionnaire.)

Discussion. The majority of the reviewers indicated the techniques for performing the exercises were easy to understand. One reviewer commented on this question indicating an understanding of the challenges of writing these types of descriptions. This reviewer noted, "I know it is challenging to write movement descriptions using purely lay terminology. Nice job with that!"

Manual Evaluation Question 11

Descriptions of exercises provide adequate information for performing the exercises. (Corresponds to question 11 on Mother Evaluation Questionnaire.)

There were no comments made by reviewers on this question.

Manual Evaluation Question 12

The manual adequately covers the topic of postpartum resistance exercise. (Corresponds to question 12 on Mother Evaluation Questionnaire.)

Discussion. The reviewers strongly supported the statement that the manual adequately covered the topic of postpartum exercise, with one reviewer even exclaiming, "Yes! I learned a lot (and this is my second time around)!" However, another reviewer astutely pointed out that there were not enough back exercises in the manual, especially considering research pointed out by the author in a previous chapter of the manual. This same reviewer pointed out, "...your research section states that the back is one of the 3 primary areas in need of postpartum exercise!"

Manual Evaluation Question 13

I would feel comfortable referring postpartum women to this manual as a source of information on resistance exercise.

Discussion. The reviewers agreed that they would be comfortable referring postpartum women to the manual. One reviewer stated, "If they asked me, I would recommend that they check the manual out." "It is about time we have such a manual with detail," noted another reviewer. "The pictures were very clear and easy to follow."

Manual Evaluation Question 14

I have advised (all, most, some, or no) women I meet with on resistance exercise within the past year.

Discussion. Only two of the four reviewers had advised women on resistance exercise, and both of these reviewers indicated "some" as the response

to this question. One reviewer elaborated on their response by explaining, "But not in such a general and detailed fashion as this manual provides. This manual will be an excellent referral. I need one in my waiting room!"

Manual Evaluation Question 15

Is there any other information that should be included in the manual? Corresponds to question 15 on Mother Evaluation Questionnaire.)

Representative Comments. "Appreciated description of PPD and exercise and its effects on breast milk- very informative."

"I did note that there seem to be no warnings in the book about the safety of the infant or appropriateness for the infant. ...[I] was concerned about the weights (jars?) and the possibility of them accidentally falling and injuring the infant."

"In the pictures I see awareness of the infant and many smiles from the mother to the baby, but the baby in many of these exercises just seems to be an object."

"...the models that are used are not ethnically diverse."

"More exercises for the back."

Discussion. A variety of suggestions were provided by the reviewers in response to additional information that should be provided in the manual. One reviewer pointed out an apparent lack of warnings about the safety of an infant around heavy objects or the appropriateness of the exercises for younger babies. Although there is a discussion about safety and appropriateness on page 28 of the manual, it is unclear if the reviewer may not have seen it or thought the discussion needed to be more of a warning and have a stronger presence in the

text. Additionally, another reviewer was of the opinion there was not enough interaction between the mothers and their babies during the exercises. Rather than having fun and playing with the mother, the reviewer saw the baby as more of an object, whose needs (not wanting to participate, or wanting more interaction, for example) needed to be better addressed.

There was one comment that there was a lack of apparent ethnic diversity in the manual. Although models of different ethnic heritages were used, it appears the reviewer desired the use of models with more apparent differences in their physical features.

One of the more perceptive reviewers noted the need for additional back exercises in the manual. As described in the manual on pages 12 and 13, postpartum women can and should begin back exercises soon after delivery. Although the manual includes one back exercise, more simple, safe, effective, and appropriate back exercises need to be sought and included in the manual.

Manual Evaluation Question 16

Is there any information that should be excluded from the manual? (Corresponds to question 16 on Mother Evaluation Questionnaire.)

Discussion. None of the reviewers indicated anything should be excluded from the manual. "What a wonderful manual. It covers all the basic exercise principles and suggests an activity that new moms can enjoy as they bond with their babies," commented one reviewer. However, one reviewer noted, "The description of resistance exercises may be confusing to people unfamiliar with terminology- especially 1RM." Although the reviewer did not indicate that the description should be removed, there was an implication that the description

may need to be written with less confusing terminology, or with definitions readily available for those terms that may be unfamiliar to the reader.

Manual Evaluation Question 17

Other comments or suggestions. (Corresponds to question 17 on Mother Evaluation Questionnaire.)

Representative Comments. "Excellent project. Clear and thoughtful with very practical applications."

"This manual is an excellent idea! I commend you and your advisor for the good work!"

"Perhaps having a chart in the book about typical development of infants might be helpful. This might help a mother understand what exercises might work best for her to work with her infant as he/she goes through different ages."

"Perhaps including a plastic placard of the pictures shown on page 30 and 31 would be an added bonus. That way the new exercisees can carry it with them in their diaper bags at all times."

"In rereading chapter three I see that you did recommend beginning with resistance and adding aerobics later, but no explanation or discussion took place about why or the different benefits that the two forms provide, or how they might complement each other for postpartum mothers."

Discussion. When given an open-ended option to give feedback on the manual, different suggestions were provided by the reviewers. One suggestion was to include an infant development chart with the exercise manual. Such a chart could list the approximate ages an infant goes through various cognitive

and motoric changes. It would help mothers (especially those with their first child) better understand what developmental phase their child is going through and better adapt the exercises to the needs of their child.

Another suggestion was to provide a laminated copy of pages 30 and 31 of the manual. These pages contain a summary in pictures of all of the exercises provided in the manual. Carrying a copy of these pages could enable a mother to refer back to exercises conveniently whether at home, exercising at a friend's house, or even at a park. By laminating the pages, it would allow the mother to wipe off the inevitable spills that occur with children and help keep the pages looking better and lasting longer.

Finally, one reviewer wanted more information on aerobic and resistance exercise and how they complement one another in an exercise program. Although the written part of the manual was only intended as an introduction to aerobic and resistance exercise principles, it appears that a more thorough discussion within the manual may be warranted, including the types of exercises, how they interact with one another, and how each contributes to different aspects of the total fitness picture. Providing an additional chapter on how to incorporate these two types of exercise together in an overall healthy lifestyle could provide better understanding of how to use them in a more complete exercise program.

Mother Evaluation Question 1

The manual covers the information I expected.

There were no comments made by reviewers on this question.

Mother Evaluation Question 9

The photographs provided realistic expectations of the exercises.

There were no comments made by reviewers on this question.

Mother Evaluation Question 13

Exercises appear appropriate for play with my child.

Discussion. Both reviewers indicated they "strongly agreed" that the exercises were appropriate for play with their own children. "I was surprised at how safe, but fun it looks," noted one reviewer.

Mother Evaluation Question 14

I would try the exercise program outlined in the manual if it were made available to me.

Discussion. The reviewers wrote positive comments to expand on their responses of "strongly agree" to question 14. Because the manual is directed toward postpartum mothers, it was reassuring to see that both reviewers were willing to try the manual. One reviewer indicated, "I will give it [the exercise program] a shot on my own in the coming weeks." "I enjoyed learning some new nursery rhymes, too!" exclaimed the other reviewer.

Chapter 5

CONCLUSIONS

Summary

The overall response to the manual from the reviewers was strongly positive. The feedback obtained from the surveys included areas of concern, areas that should be better emphasized, and some helpful additions. The reviewers believed the overall format and layout of the manual could be better suited to the target audience rather than reflecting a more research-oriented format. There was also a concern that some of the terminology could be confusing to the audience, such as biomechanist, 1 rep max, and state anxiety. The lack of apparent ethnic diversity of the models used in the photographs was also noted. An area for improvement included more strongly emphasizing the need to pay attention to the safety of an infant when they are participants in the exercise itself. Interaction during the exercises with the infant's needs in mind was also suggested. The reviewers concluded with suggestions that could enhance the manual, such as adding an infant development chart, adding a laminated copy of the exercise summary list in the manual, including more information on back exercises, adding photographs of resistance weights that could be used (other than a child), and describing the interaction of aerobic and resistance exercise in an exercise plan.

Recommendations

The execution of this project was not without its own lessons. The creation of a manual is a large undertaking with many pieces to plan and execute. With careful planning, many logistical problems can be anticipated and

thwarted. In creating this manual, incredible value was found in creating a full mock-up of the entire project, from photography to printing a high quality "finished" version *before* the actual manual production began. This enabled the author to find many planning, execution, and even cost errors in the process without negatively impacting the final project. It was much easier (and more accurate) to estimate times for completing various tasks within the project once a practice run of each task had been achieved. It also allowed for alternate strategies for completing some of the more time intensive or expensive parts of the project.

There were, however, some aspects of the project that could have been handled more successfully. Two issues were noted by the author that could be better anticipated in a future execution of this type of project: the number of reviewers that completed and returned their questionnaires was lower than desired, and feedback from postpartum mothers who have used the manual for a 12 week period should be acquired. When obtaining reviewers, it is hard to estimate how many will actually return completed questionnaires. Fortunately, those who did return their questionnaires in this project were extremely thoughtful and thorough in filling them out. However, it would be beneficial to obtain more feedback from all types of reviewers to ensure a very thorough critique of the body of work.

One intriguing piece of feedback that was not included in this project was review information provided by postpartum mothers who had participated in the actual postpartum progressive resistance exercise program. It would be extremely helpful in creating manuals such as this to get feedback from the

target audience *after* using the manual. In this case, the feedback is somewhat speculative on how helpful the manual will be in helping postpartum women begin a progressive resistance exercise program. In the future it would be valuable to obtain reviews from the target audience after using a manual to assess the manual's effectiveness in communicating what the author had intended it to communicate.

Future revisions specific to the postpartum progressive resistance manual should incorporate the following:

1. a writing format that is more accessible to the target audience;

2. immediate definitions in the text of terminology that may be unfamiliar to the reader;

3. photographs of more obviously ethnically diverse models to more accurately reflect the postpartum mother population;

4. greater emphasis on infant safety during exercise;

5. greater emphasis on infants' responses and comfort with the exercises being performed with them;

6. more exercises for the back;

7. an infant development chart to enhance the appropriate interaction of mother and baby as the child develops;

8. a laminated card of the summary pages of the manual for convenience of the mother;

9. an additional chapter providing more information on the interactions between aerobic and resistance exercise and how they complement one another in an exercise program.

REFERENCES

American College of Obstetrics and Gynecology. (1994). Exercise during pregnancy and the postpartum period. ACOG Technical Bulletin Number 189--February 1994. International Journal of Gynecology and Obstetrics, 45, 65-70.

American College of Sports Medicine. (1998). The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. ACSM Position Stand June 1998. Medicine & Science in Sports & Exercise, 30, 975-991.

American College of Sports Medicine. (1999). Women's heart health. Current Comment from the American College of Sports Medicine, 1-3.

Anderson, R. (1999). Exercise, an active lifestyle, and obesity. The Physician and Sportsmedicine, 27 (10), 41-43.

Andrew, G., Oldridge, N., Parker, J., Cunningham, D., Rechnitzer, P., Jones, N., Buck, C., Kavanagh, T., Shephard, R., & Sutton, J. (1981). Reasons for dropout from exercise programs in post-coronary patients. Medicine and Science in Sports and Exercise, 1, 164-168.

Artal, M., & Sherman, C. (1998). Exercise against depression. The Physician and Sportsmedicine, 26 (10), 55-61.

Artal, R., & Buckenmeyer, P. (1995). Cover story: Exercise during pregnancy and postpartum. Journal of Contemporary OB/GYN, 50, 62-66.

Artal, R., Masaki, D., Khodiguian, N., Romem, Y., Rutherford, S., & Wiswell, R. (1989). Exercise prescription in pregnancy: Weight-bearing versus non-weight-bearing exercise. American Journal of Obstetrics and Gynecology, 161, 1464-1469.

Becker, C. (1980). The postpartum period: What is reality? The Canadian Nurse, December, 24-27.

Blackburn, S., & Loper, D. (1992). Maternal, fetal, and neonatal physiology. Philadelphia: W.B. Saunders.

Block, R., Hess, L., Timpano, E., & Serlo, C. (1985). Physiologic changes in the foot during pregnancy. Journal of the American Podiatry Medical Association, 75, 297-299.

Bonen, A., Campagna, P., & Beresford, P. (1995). Substrate and hormonal responses during exercise classes at selected stages of pregnancy. Canadian Journal of Applied Physiology, 20, 440-451.

Brehm, B. (1989). Helping the postpartum client. Fitness Management, 5, 17.

Butte, N., & Hopkinson, J. (1998). Body composition changes during lactation are highly variable among women. Journal of Nutrition, 128, s381-s385.

Calguneri, M., Bird, H., & Wright, V. (1982). Changes in joint laxity occurring during pregnancy. Annals of the Rheumatic Diseases, 41, 126-128.

Capeless, E., & Clapp, J. (1989). Cardiovascular changes in early phase of pregnancy. American Journal of Obstetrics and Gynecology, 161, 1449-1453.

Capeless, E., & Clapp, J. (1991). When do cardiovascular parameters return to their preconception values? American Journal of Obstetrics and Gynecology, 165, 883-886.

Carey, G., Quinn, T., & Goodwin, S. (1997). Breast milk composition after exercise of different intensities. Journal of Human Lactation, 13, 115-120.

Caspersen, C., Powell, K., & Christenson, G. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. Public Health Reports, 100, 126-131.

Chlebowski, R. (2000). Primary care: Reducing the risk of breast cancer. The New England Journal of Medicine, 343, 191-198.

Clapp, J., & Capeless, E. (1991). The VO_2 max of recreational athletes before and after pregnancy. Medicine and Science in Sports and Exercise, 23, 1128-1133.

Clapp, J., & Little, K. (1995). The interaction between regular exercise and selected aspects of women's health. American Journal of Obstetrics and Gynecology, 173, 2-9.

Cohen, J. (1966). And what about exercises. Bulletin of the American College of Nurse-Midwives, 11, 5-15.

Danforth, D. (1967). Pregnancy and labor from the vantage point of the physical therapist. American Journal of Physical Medicine, 46, 653-658.

Devine, C., Bove, C., & Olson, C. (2000). Continuity and change in women's weight orientations and lifestyle practices through pregnancy and the postpartum period: The influence of life course trajectories and transitional events. Social Science & Medicine, 50, 567-582.

Devine, C., & Olson, C. (1992). Women's perceptions about the way social roles promote or constrain personal nutrition care. Women & Health, 19, 79-95.

Dewey, K. (1998a). Effects of maternal caloric restriction and exercise during lactation. Journal of Nutrition, 128, s386-s389.

Dewey, K. (1998b). Maternal body composition, caloric restriction and exercise during lactation: An overview. Journal of Nutrition, 128, s379-s380.

Dewey, K., Lovelady, C., Nommsen-Rivers, L., McCrory, M., & Lonnerdal, B. (1994). A randomized study of the effects of aerobic exercise by lactating women on breast-milk volume and composition. The New England Journal of Medicine, 330, 449-453.

Dewey, K., & McCrory, M. (1994). Effects of dieting and physical activity on pregnancy and lactation. American Journal of Clinical Nutrition, 59, s446-s453.

DiFiore, J., & Gaskell, J. (1993). "Curling and cuddling" abdominal exercises during and after pregnancy. Midwives Chronicles, 106, 254-256.

Dipietro, L. (1999). Physical activity in the prevention of obesity: Current evidence and research issues. Medicine and Science in Sports and Exercise, 31, s542-s546.

Dishman, R. (1981). Biologic influences on exercise adherence. Research Quarterly for Exercise and Sport, 52, 143-159.

Dishman, R. (1986). Exercise compliance: A new view for public health. The Physician and Sportsmedicine, 14 (10), 127-145.

Dishman, R. (1994). Introduction: Consensus, problems, and prospects. In R. Dishman (Ed.), Advances in exercise adherence (pp. 1-27). Champaign, IL: Human Kinetics.

Dubbert, P. (1992). Exercise in behavioral medicine. Journal of Consulting and Clinical Psychology, 60, 613-618.

DuCharme, K., & Brawley, L. (1995). Predicting the intentions and behavior of exercise initiates using two forms of self-efficacy. Journal of Behavioral Medicine, 18, 479-497.

Duffy, L. (1997). Breastfeeding after strenuous aerobic exercise: A case report. Journal of Human Lactation, 13, 145-146.

Duncan, T., Duncan, S., & McAuley, E. (1993). The role of domain and gender-specific provisions of social relations in adherence to a prescribed exercise regimen. Journal of Sport & Exercise Psychology, 15, 220-231.

Dunn, A., Marcus, B., Kempert, J., Garcia, M., Kohl, H., & Blair., S. (1999). Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: A randomized trial. The Journal of the American Medical Association, 281, 327-334.

Durstine, L. D., King, A. C., Painter, P.L., Roitman, J.L., & Zwiren, L.D. (Eds.). (1993). ACSM's resource manual for guidelines for exercise testing and prescription. Philadelphia: Williams & Wilkins.

Erickson, J., & Gillespie, C. (2000). Reasons women discontinued participation in an exercise and wellness program. The Physical Educator, 57, 2-7.

Fahey, T., Insel, P., & Roth, W. (2001). Fit & well (4th ed.). Mountain View, CA: Mayfield.

Findlay, E., & Capes, M. (1969). Figure control for your postpartum patient. RN, 32, 38-41.

Foss, M., & Keteyian, S. (1998). Fox's physiological basis for exercise and sport (6th ed.). Boston: McGraw-Hill.

Franklin, B. (1988). Program factors that influence exercise adherence: Practical adherence skills for the clinical staff. In R. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 237-258). Champaign, IL: Human Kinetics.

Gale, J., Eckhoff, W., Mogel, S., & Rodnick, J. (1984). Factors related to adherence to an exercise program for healthy adults. Medicine and Science in Sports and Exercise, 16, 544-549.

Gardner, D., & Campbell, B. (1991). Assessing postpartum fatigue. American Journal of Maternal Child Nursing, 16, 264-266.

George, G., & Berk, B. (1981). Exercise before, during, and after pregnancy. Topics in Clinical Nursing, 2, 33-39.

Gjerdingen, D., & Chaloner, K. (1994). Mothers' experience with household roles and social support during the first postpartum year. Women & Health, 21, 57-74.

Godin, G., Desharnais, R., Valois, P., Lepage, L., Jobin, J., & Bradet, R. (1994). Differences in perceived barriers to exercise between high and low intenders: Observations among different populations. American Journal of Health Promotion, 8, 279-284.

Godin, G., Vezina, L., & Leclerc, O. (1989). Factors influencing intentions of pregnant women to exercise after giving birth. Public Health Reports, 104, 188-195.

Gregory, R., Wallace, J., Gfell, L., Marks, J., & King, B. (1997). Effect of exercise on milk Immunoglobulin A. Medicine and Science in Sports and Exercise, 29, 1596-1601.

Gruis, M. (1977). Beyond maternity: Postpartum concerns of mothers. The American Journal of Maternal Child Nursing, 2, 182-188.

Harrington, M. (1991). Time after work: Constraints on the leisure of working women. Society and Leisure, 14, 115-132.

Hart, M., Morton, M., Hosenpud, M., & Metcalfe, J. (1986). Aortic function during normal human pregnancy. American Journal of Obstetrics and Gynecology, 154, 887-891.

Hewitt, P. (1993). Flexible working: Asset or cost? Policy Studies, 14, 18-28.

Hu, F., Stampfer, M., & Colditz, G. (2000). Physical activity and risk of stroke in women. The Journal of the American Medical Association, 283, 2961-2967.

Jaque-Fortunato, S., Wiswell, R., Khodiguian, N., & Artal, R. (1996). A comparison of the ventilatory responses to exercise in pregnant, postpartum, and nonpregnant women. Seminars in Perinatology, 20, 263-276.

Johnson, C., Corrigan, S., Dubbert, P., & Gramling, S. (1990). Perceived barriers to exercise and weight control practices in community women. Women & Health, 16, 177-191.

Johnson, N., & Heller, R. (1998). Prediction of patient nonadherence with home-based exercise for cardiac rehabilitation: The role of perceived barriers and perceived benefits. Preventive Medicine, 27, 56-64.

Keen, R. (1999). Effects of lifestyle interventions on bone health. Lancet, 354, 1923-1924.

Kegel, A. (1948). Progressive resistance exercise in the functional restoration of the perineal muscles. American Journal of Obstetrics and Gynecology, 56, 238-248.

Kendzierski, D., & Johnson, W. (1993). Excuses, excuses, excuses: A cognitive behavioral approach to exercise implementation. Journal of Sport & Exercise Psychology, 15, 207-219.

Ketter, D., & Shelton, B. (1983). In-hospital exercises for the postpartal woman. The American Journal of Maternal Child Nursing, 8, 120-124.

King, A., Blair, S., Bild, D., Dishman, R., Dubbert, P., Marcus, B., Oldridge, N., Paffenbarger, R., Powell, K., & Yeager, K. (1992). Determinants of physical activity and interventions in adults. Medicine and Science in Sports and Exercise, 24, s221-s226.

King, A., Haskell, W., Taylor, C., Kraemer, H., & DeBusk, R. (1991). Group vs. home based exercise training in healthy older men and women: A community based trial. The Journal of the American Medical Association, 266, 1535-1542.

Klonoff, E., Annechild, A., & Landrine, H. (1994). Predicting exercise adherence in women: The role of psychological and physiological factors. Preventive Medicine, 23, 257-262.

Koltyn, K., & Schultes, S. (1997). Psychological effects of an aerobic exercise session and a rest session following pregnancy. Journal of Sports Medicine and Physical Fitness, 37, 287-291.

Leddy, S. (1997). Incentives and barriers to exercise in women with a history of breast cancer. Oncology Nursing Forum, 5, 885-890.

Leopold, K., & Zoschnick, L. (1997, August). Postpartum Depression [29 paragraphs]. The Female Patient [On-line]. Available: http://www.obgyn.net/english/pubs/features/tfp/leopold.htm

Little, K., Clapp, J., & Ridzon, S. (1994). Effect of exercise on postpartum weight and subcutaneous fat loss. Medicine and Science in Sport and Exercise, 26, s15.

Lotgering, F., Spinnewijn, W., Struijk, P., Boomsma, F., & Wallenburg, H. (1998). Respiratory and metabolic responses to endurance cycle exercises in pregnant and postpartum women. International Journal of Sports Medicine, 19 (3), 193-198.

Lovelady, C., Lonnerdal, B., & Dewey, K. (1990). Lactation performance of exercising women. American Journal of Clinical Nutrition, 52, 103-109.

MacLennan, A. (1991). The role of the hormone relaxin in human reproduction and pelvic girdle relaxation. Scandinavian Journal of Rheumatology, Supplement, 88, 7-15.

Manson, J., Hu, F., & Edwards, J. (1999). A prospective study of walking as compared with vigorous exercise in the prevention of coronary heart disease in women. The New England Journal of Medicine, 341, 650-658.

May, A. (1995). Using exercise to tackle postnatal depression. Health Visitor, 68, 146-147.

McCready, M., & Long, B. (1985). Locus of control, attitudes toward physical activity, and exercise adherence. Journal of Sport Psychology, 7, 346-359.

Moffatt, R., & Cucuzzo, N. (1993). Strength considerations for exercise prescription. In J. L. Durstine, A. C. King, P. L. Painter, J. L. Roitman, L. D. Zwiren, & W. L. Kenney (Eds.), ACSM's resource manual for guidelines for exercise testing and prescription (2nd ed.) (pp. 337-343). Philadelphia: Williams & Wilkins.

Moran, C., Holt, V., & Martin, D. (1997). What do women want to know after childbirth? Birth, 24, 27-34.

Morin, K., Gennaro, S., & Fehder, W. (1999). Nutrition and exercise in overweight and obese postpartum women. Applied Nursing Research, 12, 13-21.

Mullen, P., Quinn, V., & Ershoff, D. (1990). Maintenance of nonsmoking postpartum by women who stopped smoking during pregnancy. The American Journal of Public Health, 80, 992-994.

National Center for Chronic Disease Prevention. (1999). Physical activity and health: A report of the surgeon general [On-line]. Available: http://www.cdc.gov/nccdphp/wgr/women.htm

Noble, E. (1995). Essential exercises for the childbearing year. Harwich, MA: New Life Images.

Ohlin, A., & Rossner, S. (1996). Factors related to body weight changes during and after pregnancy: The Stockholm pregnancy and weight development study. Obesity Research, 4, 271-276.

Oldridge, N. (1984). Compliance and drop-out in cardiac exercise rehabilitation. American Journal of Cardiology, 4, 166-177.

Otman, A., Beksac, M., & Bagoze, O. (1989). The importance of lumbar lordosis measurement device's application during pregnancy, and post-partum isometric exercise. European Journal of Obstetrics, Gynecology, and Reproductive Biology, 31, 155-162.

Parsons C. (1998). Damage to the pelvic floor: Causes, prevention and treatment. Practicing Midwife, 1, 14-16.

Pate, R., & Burgess, M. (1993). Appendix A: Terminology in exercise physiology. In J. L. Durstine, A. C. King, P. L. Painter, J. L. Roitman, L. D. Zwiren, & W. L. Kenney (Eds.), ACSM's resource manual for guidelines for exercise testing and prescription (2nd ed.) (pp. 570-574). Philadelphia: Williams & Wilkins.

Patience, T., Dettori, J., & Hoyt, R. (1998). The effect of pregnancy on postpartum fitness in U.S. Army soldiers. Medicine and Science in Sports and Exercise, 30, 320.

Pernoll, M., Metcalfe, J., Kovach, P., Wachtel, R., & Dunham, M. (1975). Ventilation during rest and exercise in pregnancy and postpartum. Respiration Physiology, 25, 295-310.

Perri, M., Martin, A., Leermakers, E., Sears, S., & Noteloviz, M. (1997). Effects of group versus home based exercise in the treatment of obesity. Journal of Consulting and Clinical Psychology, 65, 278-286.

Pivarnik, J. (1996). Cardiovascular responses to aerobic exercise during pregnancy and postpartum. Seminars in Perinatology, 20, 242-249.

Potter, H., & Strauss, G. (1997). Reproducibility of isokinetic trunk muscle torque evaluation in postpartum women. Isokinetics and Exercise Science, 6, 187-196.

Quinn, T., & Carey, G. (1999). Does exercise intensity or diet influence lactic acid accumulation in breast milk? Medicine and Science in Sports and Exercise, 31, 105-110.

Sady, M., Haydon, B., Sady, S., Carpenter, M., Thompson, P., & Coustan, D. (1990). Cardiovascular response to maximal cycle exercise during pregnancy and at two and seven months post partum. American Journal of Obstetrics and Gynecology, 162, 1181-1185.

Sady, S., & Carpenter, M. (1989). Aerobic exercise during pregnancy. Sports Medicine, 7, 357-375.

Sampselle, C., Seng, J., Yeo, S., Killion, C., & Oakley, D. (1999). Physical activity and postpartum well-being. Journal of Obstetrics Gynecology Neonatal Nursing, 28, 41-49.

Schaper, A., Rooney, B., Kay, N., & Silva, P. (1994). Use of the Edinburgh Postnatal Depression Scale to identify postpartum depression in a clinical setting. Journal of Reproductive Medicine, 39, 620-624.

Schauberger, C., Rooney, B., Goldsmith, L., Shenton, D., Silva, P., & Schaper, A. (1996). Peripheral joint laxity increases in pregnancy but does not correlate with serum relaxin levels. American Journal of Obstetrics and Gynecology, 174, 667-671.

Schelkun, P. (1991). Exercise and breast-feeding mothers. The Physician and Sportsmedicine, 19 (4), 109-116.

Sefi, S. (1987). Running a postnatal exercise group. Health Visitor, 60, 197-198.

Smith, M. (1989). Postnatal concerns of mothers: An update. Midwifery, 5, 182-188.

South-Paul, J., Rajagopal, K., & Tenholder, M. (1992). Exercise responses prior to pregnancy and in the postpartum state. Medicine and Science in Sports and Exercise, 24, 410-414.

Spinnewijn, W., Wallenburg, H., Struijk, P., & Lotgering, F. (1996). Peak ventilatory responses during cycling and swimming in pregnant and nonpregnant women. Journal of Applied Physiology, 81, 738-742.

Stampfer, M., Hu, F., & Manson, J. (2000). Primary prevention of coronary heart disease in women through diet and lifestyle. The New England Journal of Medicine, 343, 16-22.

Stephenson, S. (1987). Is there a relationship between prenatal exercise and postpartum depression. Unpublished master's thesis, University of British Columbia, Vancouver, Canada.

Stover, A., & Marnejon J. (1995). Postpartum care. American Family Physician, 52, 1465-1472.

Sutherland, V., & Cooper, C. (1990). Exercise and stress management: Fit employees-healthy organizations? International Journal of Sport Psychology, 21, 202-217.

Tangley, L., & Miller, J. (1988). Exercise: The effects on cancer and reproduction. BioScience, 38, 321-322.

Terborg, J., Hibbard, J., & Glasgow, R. (1995). Behavior change at the worksite: Does social support make a difference? American Journal of Health Promotion, 10, 125-131.

Troy, N., Dalgas-Pelish, P., & Vichitsukon. (1997). The natural evolution of postpartum fatigue among a group of primiparous women. Clinical Nursing Research, 5, 126-142.

Uzendoski, A., Latin, R., Berg, K., & Moshier, S. (1990). Physiological responses to aerobic exercise during pregnancy and post-partum. Journal of Sports Medicine and Physical Fitness, 30, 77-82.

Valancogne, G., & Galaup, J. (1993). Rehabilitation during pregnancy and in the postpartum. Review of Gynecology and Obstetrics, 88, 498-508.

Van Raaij, J., Schonk, C., Vermaat-Miedema, S., Peek, M., & Hautvast, J. (1990). Energy cost of walking at a fixed pace and self-paced before, during, and after pregnancy. American Journal of Clinical Nutrition, 51, 158-61.

Viadero, A. (1988). Exercise and good postpartum posture. Midwifery Today, 1 (6), 17-19.

Voaklander, D., & Brison, R. (1991) Exercise adherence in healthy adult women. Journal of Human Movement Studies, 20, 239-247.

Vullo, V., Richardson, J., & Hurvitz, E. (1996). Hip, knee, and foot pain during pregnancy and the postpartum period. Journal of Family Practice, 43, 63-68.

Walker, L. (1996). Predictors of weight gain at 6 and 18 months after childbirth: A pilot study. Journal of Obstetric and Gynecological Neonatal Nursing, 25, 39-48.

Wallace, J., Ernsthausen, K., & Inbar, G. (1992). The influence of the fullness of milk in the breasts on the concentration of lactic acid in postexercise breast milk. International Journal of Sports Medicine, 13, 395-398.

Wallace, J., Inbar, G., & Ernsthausen, K. (1992). Infant acceptance of postexercise breast milk. Pediatrics, 89, 1245-1247.

Wallace, J., & Rabin, J. (1991). The concentration of lactic acid in breast milk following maximal exercise. International Journal of Sports Medicine, 12 (3), 328-331.

Williams, M., & Odoni, J. (1967). Recent advances in ante- and post-natal physiotherapy. Physiotherapy, 53, 164-166.

Williams, R. (1990a). The little Mac book. Berkeley, CA: Peachpit Press.

Williams, R. (1990b). The Mac is not a typewriter: A style manual for creating professional-level type on your Macintosh. Berkeley, CA: Peachpit Press.

Williams, R. (1994). The non-designer's design book. Berkeley, CA: Peachpit Press.

Wright, K., Carey, G., & Quinn, T. (1999). Infant acceptance of breast milk is unaffected by maternal exercise. Medicine and Science in Sports and Exercise, 31, s67.

Young, D., & King, A. (1995). Exercise adherence: Determinants of physical activity and applications of health behavior change theories. Medicine, Exercise, Nutrition, and Health, 4, 335-348.

Zaharieva, E. (1972). Olympic participation by women. The Journal of the American Medical Association, 221, 992-995.

Appendix A

A POSTPARTUM PROGRESSIVE RESISTANCE EXERCISE MANUAL

Due to the thesis publishing constraints of the Graduate Studies Office of San Jose State University, the individual page size of the manual contained in this appendix has been reduced. The photograph quality of the manual also reflects adaptations to the ascribed publishing constraints.

A Postpartum
Progressive
Resistance
Exercise
Program

Baby Rattles & Barbells

Wendy L. Du Bois
San Jose State University

Baby Rattles & Barbells

Wendy L. Du Bois
San Jose State University

A Postpartum Progressive Resistance Exercise Program

To Morgan, one of the best sources of inspiration I could ever wish for, and Eric, who once again proved to me why I am so fortunate to have him as my best friend.
With the two of you, my dreams came true.

W.L.D.

ATTENTION

As with any exercise program, it is recommended that a health care provider be consulted before starting this or any exercise program. This manual is not intended as a substitute for medical advice.

Although the exercises contained in this manual are based on standard resistance training exercises, the adaptations to the exercises may make the exercises slightly less efficient for attaining strength and endurance.

CONTENTS

FOREWARD

After the birth of my son I found myself unable to find any guidance on how to resume an exercise program, particularly one that would help me in my new daily tasks. A baby needs many hours of nursing, holding, and other care-taking activities that require increasing amounts of upper body muscular strength and endurance. I wanted to find exercises that would not only address my fitness goals, but address my new lifestyle needs as well. In creating this exercise program, I hope to give other mothers guidance to safely begin or resume a resistance exercise program and to inspire them to new exercise goals and activities.

Wendy L. Du Bois

ACKNOWLEDGMENTS

No body of work is ever produced in isolation. There have been so many wonderful people who have gone out of their way to make this project a success.

To the models, I thank you for allowing the spontaneous joy you feel while playing with your children to be captured on film.

Marcia and Peteri
Jennifer, Dillon and Connor
Gail and Thomas
Kelli and Nora
Maureen and Joey

To the numerous anonymous reviewers who continuously help me improve this project, I thank you for your precious time to make this project a success.

To the mothers who have continuously asked me when I would be finished so that they could use the exercise program, thank you for keeping me motivated to finish.

To my outstanding professors at San Jose State University, thank you for allowing me the latitude and giving your support to me so that I may pursue a project so near to my heart.

Dr. David Furst
Dr. Peggy Plato
Dr. Emily Wughalter

Lastly, to my family, without whom I could have never imagined this project coming to light. You are truly my inspiration. Mahalo.

CHAPTER ONE

CHAPTER ONE

How To Use This Manual

Chapter 1 Summary

Importance, features, and layout of the Postpartum Progressive Resistance Exercise Program are outlined.

Why A Postpartum Exercise Manual

A baby needs many hours of nursing, holding, and other caretaking activities that require increasing amounts of muscular strength and endurance (Sefi, 1987; Smith, 1989). In a group that is sure to need progressive resistance training (caring for an infant that will surely get heavier), there has been very little research on how to either prepare women prenatally or during the postpartum period to enhance muscular strength and endurance to reduce the risk of injury. The statement the American College of Obstetrics and Gynecology (ACOG) published on exercise postpartum includes very little information on postpartum exercise; most of the information is on exercise during pregnancy (ACOG, 1994). ACOG released a video in the early 1980's on what types of exercise are appropriate for postpartum women, but it is no longer available. There are few, if any, postpartum exercise classes. Handouts, support exercise groups, and books recommended by health care providers and exercise specialists would be a good start in giving women a way to exercise intelligently, without risk to their physical health. In the interim, this program stems from research on resistance exercises with pregnant women as well as general exercise studies conducted with postpartum women.

In response to surveys on their postpartum needs, postpartum women clearly indicate they want information on exercise (verbally from health care providers as well as in printed formats) and the opportunity to include their infant in their exercise regimen (Devine et al., 2000). There are few texts on postpartum exercise (most of which are out of print) and those that do exist primarily focus on aerobic exercise and spot reduction. A basic progressive resistance exercise guide outlining appropriate resistance exercise options that can be performed with an infant, reviewed by experts from diverse backgrounds in women's health, would be a good start in guiding postpartum women in safely beginning or resuming a progressive resistance exercise program.

This basic progressive resistance exercise program is designed for healthy women who have had a child and have received clearance from their medical practitioner to begin exercising (usually after the six week postpartum checkup). Because it is general, every woman who undertakes this exercise program must evaluate her own needs and abilities. This program is not to be substituted for medical advice. If there is any doubt about whether an exercise is appropriate, seek advice from a health care practitioner.

Features Of The Postpartum Progressive Resistance Exercise Program

1. Exercises are simple to do (equipment is not mandatory).
2. Exercises are integrated into play with child.
3. Each major muscle group is exercised.
4. Relatively short duration of time is needed to complete group of exercises.
5. Exercise program is effective in increasing strength and/or endurance of muscles specifically used in child care.

This program is designed to be simple and practical. The exercises presented are appropriate for postpartum fitness because they take into account the physiological changes of the body that may have not yet resolved, time constraints of busy moms, adherence (one is more likely to stay with it if it can be incorporated into daily life, such as while playing on the floor with children), hassle of finding child care, and special needs resulting from holding and caring for baby. The effects of relaxin, for example, may take up to six months to resolve. Therefore, it is appropriate to exercise in ways that do not overly stretch muscles and tendons, that do not use excessive amounts of weight on joints, and that do not put excessive pressure on tendons and joints.

Because of the busy nature of child rearing, these exercises are designed to enable a mother to exercise and play with her child simultaneously. There are no heavy weights needed that could harm the child. Child care is not mandatory to complete the exercises. The Exercises can start or resume as needed (part of the exercises could be done in the morning, the rest in the afternoon if needed).

Once these exercises have become routine, more exercises can be done either in conjunction or in their place. However, keep in mind that everyone's body recovers at different rates. Be sure to listen to the body and the information it gives on what it is ready for. Based on interests and personality, there are a variety of activities that can provide a great work out and be fun. Exercise does not have to be boring or agonizing It is all in the attitude.

Layout Of The Manual

There are 7 chapters in the manual.

How To Use This Manual
This chapter describes the general layout of the manual and a brief description of each chapter.

Relevant Research
A compilation of primary research from a variety of professional journals, this chapter gives some background information on postpartum physiology as well as postpartum exercise adherence.

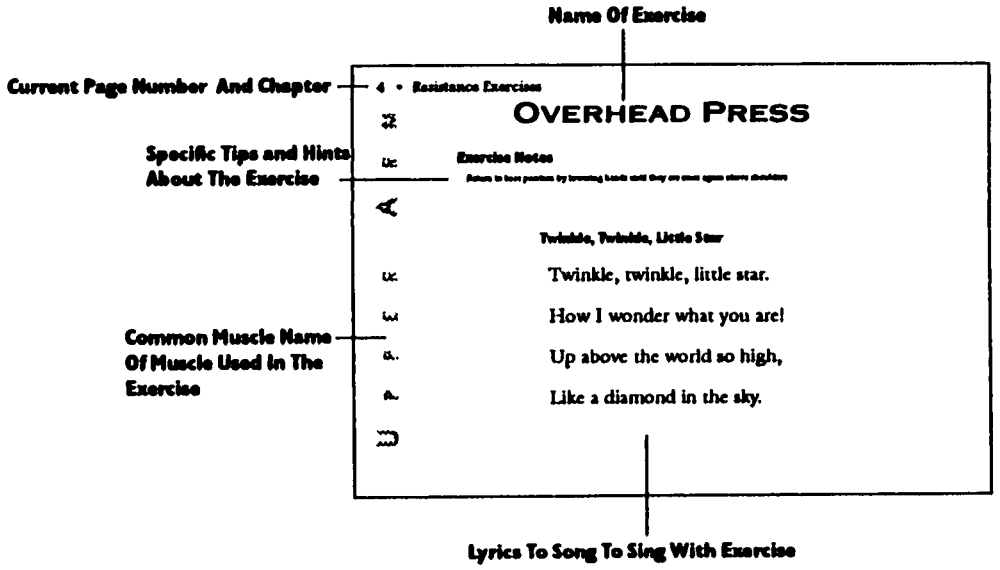
Exercise Basics
For those mothers who are just beginning to exercise, or for those that feel like they need to brush up on their general exercise knowledge, this chapter gives a brief description of aerobic, stretching, and resistance exercises. It also outlines some basic exercise principles as well as providing some definitions of terms used in this manual.

Customizing This Exercise Program
The specifics of customizing a program are found in this chapter. Information on appropriate resistance, sets, and repetitions for each type of exercise is depicted. Ideas for adherence to the program as well as fun ideas for working out with a child are also described.

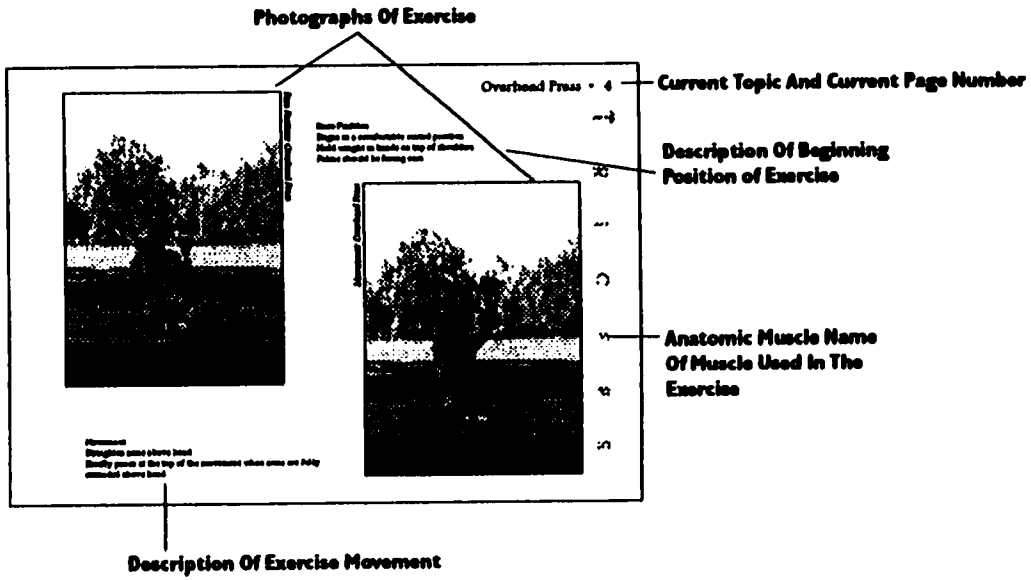
Stretching & Resistance Exercises
The photographs, descriptions, and lyrics to songs to sing while performing the exercises are provided in these chapters. The text describes the subtleties of the exercise that may not come across clearly in a photograph. It should be fairly clear how to generally perform the exercise from the photograph. (See next page for features of the exercise layout.)

References
Citations for all research cited in the manual may be found here.

LAYOUT


Name Of Exercise
Current Page Number And Chapter
4 • Resistance Exercises
OVERHEAD PRESS
Specific Tips and Hints About The Exercise
Exercise Notes
Twinkle, Twinkle, Little Star
Twinkle, twinkle, little star.
How I wonder what you are!
Up above the world so high,
Like a diamond in the sky.
Common Muscle Name Of Muscle Used In The Exercise
Lyrics To Song To Sing With Exercise

DESCRIPTION

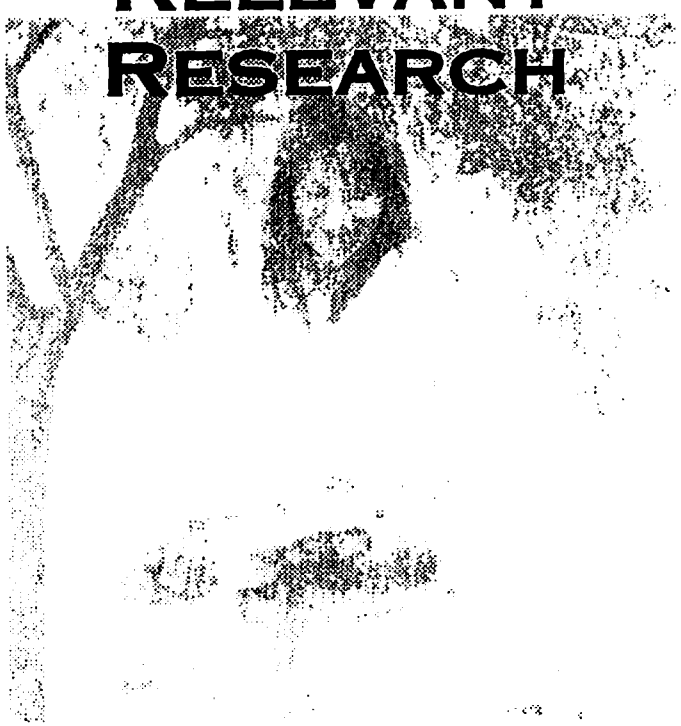


CHAPTER TWO

• Relevant Research

CHAPTER TWO

RELEVANT RESEARCH



Chapter 2 Summary

This chapter will discuss literature on the benefits and risks of postpartum exercise, the physiology of postpartum women, established resistance exercises appropriate for postpartum women, and exercise adherence. The chapter will conclude with a summary of appropriate resistance exercises and strategies to increase postpartum exercise adherence.

Potential Benefits And Risks Of Postpartum Exercise

Potential Benefits Of Postpartum Exercise

Many women who chose to exercise during the postpartum period do so to improve their fitness level, lose weight gained while pregnant, and to seek social support in a group setting (Clapp & Little, 1995; May, 1995; Sampselle, Seng, Yeo, Killion, & Oakley, 1999; Sefi, 1987). There are a variety of reasons that may motivate a woman to improve her fitness level. Most women tend to reduce the intensity of their exercise regimen and/or general activity level as they progress through their pregnancy and after delivery may find their fitness levels have declined from prepregnancy levels (Clapp & Capeless, 1991). Postpartum fatigue can be almost debilitating at times, and exercise is one way to get back some energy (Gardner & Campbell, 1991; Lovelady, Lonnerdal & Dewey, 1990). Some women, unhappy with their "new physique," find physical exercise is one way to tone newly sagging abdomens and stabilize aching backs from carrying an infant all day (Clapp & Little, 1995; Devine, Bove, & Olson, 2000; Moran, Holt, & Martin, 1997). "Cabin fever" can drive some women out of the house, searching for something else to do other than care for baby (Sefi, 1987). Regardless of the reason motivating the desire for fitness, cardiovascular fitness does improve significantly with regular aerobic exercise (45 minutes per session, 4 to 5 times per week at 60-70% of maximum heart rate) during the postpartum period for both sedentary and active women (Dewey, 1998b; Dewey, Lovelady, Nommsen-Rivers, McCrory, & Lonnerdal, 1994; Dewey & McCrory, 1994; Lovelady et al., 1990).

Many women exercise with the hope of losing weight they may have gained during their pregnancy, or weight they did not lose before they became pregnant. Although it seems logical that exercise would facilitate weight loss, during the early postpartum period (18 to 20 weeks) it is not the case (Butte & Hopkinson, 1998; Clapp & Capeless, 1991; Clapp & Little, 1995; Dewey, 1998a; Dewey & McCrory, 1994; Lovelady et al., 1990; Little, Clapp, & Ridzon, 1994; Schelkun, 1991). Nutrition and diet appear to have more effect on postpartum weight loss 6 to 18 months postpartum than exercise (Walker, 1996). However, lack of exercise 1 year after delivery may play a role in long term weight retention (Morin, Gennaro, & Fehder, 1999). Studies fail to indicate exactly when the postpartum woman's body begins to react to exercise as it did prior to pregnancy. It may be more reasonable to expect moderate weight loss by eating nutritionally balanced meals, monitoring caloric intake, and exercising regularly as a part of a comprehensive life-style plan. Until more research is conducted, each woman may be able to detect when more vigorous exercise appears to assist her in her body fat loss goals by monitoring her own body.

Exercise groups are a good way for mothers to gather and exchange thoughts, ideas, and information that can be helpful to one another (May, 1995; Sampselle et al., 1999; Sefi, 1987). Early motherhood can be a trying and lonely time and many women feel ashamed to ask for help (May, 1995). Many mothers feel societal pressure to be the model

of the perfect wife and mother with everything under control. New mothers may find themselves isolated from other adults and would simply like the opportunity to converse with others with similar interests (Sefi, 1987). Social support from other mothers and caring instructors can give a new mother support and a place where she can be herself. She can be given the opportunity to vent her frustrations in a nonthreatening environment that also gives her advice and suggestions on how to cope with her new (or renewed) roles and responsibilities if she chooses to solicit it (Clapp & Little, 1995).

One area that has received little attention in the literature is the role of exercise in reducing or alleviating postpartum depression (PPD). PPD can vary in severity from "the blues" (mild transient depression) to severe depression (Schaper, Rooney, Kay, & Silva, 1994). Exercise has been shown to reduce (and possibly prevent) varying levels of depression when done on a regular basis (Artal & Sherman, 1998). It does appear hopeful that exercise may help some cases of mild PPD (May, 1995). Postpartum women who exercised aerobically for 60 minutes reported a significant reduction in their current anxiety levels (state anxiety) as well as a better general mood with increased energy (Koltyn & Schultes, 1997). Exercise during pregnancy, however, does not appear to have an effect on occurrence of PPD (Stephenson, 1987).

In summary, the potential benefits of postpartum exercise are improved fitness level, increased energy, weight loss, social support in a group exercise setting, and possible decreased intensity of PPD.

Potential Obstacles And Risks Of Postpartum Exercise

Obstacles to exercise exist for every person who chooses to exercise. Postpartum women have additional obstacles and risks associated with childbearing. Perhaps the most obvious obstacles to exercise are a lack of sleep, lack of time (specifically due to the demand of child care), and lack of competent child care. Most new mothers experience sleep deprivation of varying degrees and when one has little energy, exercise is not usually the highest priority (Brehm, 1989; Gardner & Campbell, 1991; Moran et al., 1997). With all of the new responsibilities of caring for an infant, many mothers do not feel they have time in their day to tend to their own immediate needs, much less exercise (Artal & Buckenmeyer, 1995; Clapp & Little, 1995; Cohen, 1966; Devine et al., 2000; Findlay & Capes, 1969; Schelkun, 1991; Williams & Odoni, 1967). For those mothers determined to exercise without their babies, safe and reliable child care is also an obstacle (Devine et al., 2000; Moran et al., 1997).

Mothers may be embarrassed to find that after labor a simple cough or laugh may cause urinary leakage (Parsons, 1998). Urinary stress incontinence is usually caused when the pressure in the abdominal cavity rises and the pelvic floor muscles are too weak to keep the urethral sphincter closed. Although aerobic exercise might appear to exacerbate the problem, aerobic exercise in conjunction with circum vaginal muscle exercises can improve and often cure urinary incontinence due to weakened circum vaginal muscles (Kegel, 1948; Valancogne & Galaup, 1993).

For women who chose to breastfeed their child, successful lactation is a high priority. Breast milk quality and quantity are important for the growing infant's nutritional needs. Exercise (even high intensity) does not interfere with lactation (reduce milk volume or caloric content) or infant growth in healthy women and infants (Clapp & Little, 1995; Dewey et al., 1994; Dewey & McCrory, 1994; Lovelady et al., 1990; Sampselle et al., 1999). Regular exercise may actually benefit milk by increasing the volume and caloric content of the milk (Dewey et al., 1994; Lovelady et al., 1990; Schelkun, 1991). Mothers may be concerned that exercise will change

the taste of their milk and that their infant may reject it post exercise. Concentration of lactic acid does increase in breast milk post exercise in proportion to the level of exertion; the highest levels of lactic acid are found when exercising to VO_2 max levels (Carey, Quinn, & Goodwin, 1997; Quinn & Carey, 1999; Wallace, Inbar, & Ernsthausen, 1992; Wallace & Rabin, 1991; Wright, Carey, & Quinn, 1999). Lactic acid has a sour taste and infants can detect the flavor of sour (Wallace & Rabin, 1991). However, most infants do not appear affected by the presence of the lactic acid in post exercise milk (Dewey, 1998a; Dewey et al., 1994; Dewey & McCrory, 1994; Wright et al., 1999). For the few infants that do reject post exercise milk or suffer gastric pain after ingesting post exercise milk, pumping before exercise and feeding it to the infant post exercise or using artificial breast milk for the post exercise feeding may alleviate infant distress (Duffy, 1997; Wallace, Ernsthausen, & Inbar, 1992).

Once she begins exercising, it does not take long for the nursing mother to identify the need for adequate breast support. Because of the risk of plugging ducts (which can lead to a painful case of mastitis) or irritating the nipples, nursing mothers need to find bras that are supportive without putting pressure on the breast tissue (Clapp & Little, 1995; Findlay & Capes, 1969; Schelkun, 1991). Wearing two cotton sport bras provide a uniform compression and allow the skin to breathe (Clapp & Little, 1995). Nursing or pumping before exercise may also decrease the amount of milk in the breasts and increase exercise comfort. However, this should not be done by mothers whose infants are sensitive to post exercise lactic acid levels in their breast milk because lactic acid levels peak more slowly and are elevated much longer in breasts emptied before exercise than breasts left full (Wallace, Ernsthausen, et al., 1992). The physiological reasons for this phenomenon are not presently understood.

In summary, the potential obstacles and risks of postpartum exercise include lack of sleep (fatigue), lack of time, lack of safe and reliable child care, urinary stress incontinence during exercise if circum vaginal muscles are weak, possible issues with breastfeeding, and obtaining adequate breast support.

Physiological Changes From Pregnancy To Postpartum

Although many physicians would consider the postpartum period to encompass the 6 to 8 weeks following delivery, not all of the physiological systems of the body recover from the adaptations to pregnancy that quickly. It is generally accepted that the hemostatic system, cardiovascular system, renal system, and gastrointestinal system all return to their prepregnancy functioning by 6 weeks following delivery (ACOG, 1994; Blackburn & Loper, 1992; Danforth, 1967). However, some physiological changes that have been studied more closely reflect changes that may not be resolved in the 6 weeks following delivery. There may even be some pregnancy alterations that never revert to prepregnancy states.

The cardiovascular system has had more attention than other body systems in the literature and has been studied in progressively longer periods after delivery. Aerobic capacity is not regained 4 to 8 weeks postpartum (when compared to prepregnancy measurements) in women who did not continue exercising throughout pregnancy and immediately after delivery (South-Paul, Rajagopal, & Tenholder, 1992). The results are not surprising and appear to reflect what would normally occur during any detraining period when exercise and activity levels decrease. However, when participants who had resumed exercising were studied 12 weeks postpartum,

aerobic capacity had not been regained and had not returned to prepregnancy levels (Capeless & Clapp, 1991; Clapp & Capeless, 1991; Pivarnik, 1996). When tested 7 months after delivery, cardiovascular test results were closer to prepregnancy levels than they had been at 2 months postpartum, but had not yet returned to those prepregnancy values (Sady et al., 1990). As part of a formalized fitness test, postpartum soldiers performed three tests (push-ups, sit-ups, and a timed 2 mile run) and had not regained their prepregnant fitness levels 6 to 9 months after delivery (Patience et al., 1998). These women were all a part of a formal training regimen and had been in a structured training group for more than 3 months before the tests were given. Breast feeding appears to affect plasma volume of the blood, which may decrease the rate at which a women's body recovers from pregnancy (Hart, Morton, Hosenpud, & Metcalfe, 1986). Women who have had more than one child have an aortic diameter that is permanently larger than both nonpregnant women and women who have had only one child (Hart et al., 1986). Changes made to the cardiovascular system may not only take more than 6 weeks to revert back to prepregnancy states, they may never do so.

Muscles, joints, and ligaments may need longer than 6 weeks to revert to prepregnancy form, function, and structure (Schauberger et al., 1996). Typically due to weakened abdominal muscles, lumbar lordosis (a curvature of the lower back that is associated with back pain) in the postpartum period may continue for more than 6 weeks (Otman, Beksac, & Bagoze, 1989). Relaxin is one of the hormones that cause ligaments to "loosen" during pregnancy by changing how collagen fibers are configured and allowing them to expand (Danforth, 1967; MacLennan, 1991). Joint and ligament laxity facilitate the birth of the child by allowing the baby to travel through the cervix, vagina and pelvis (Artal et al., 1989). Although relaxin dissipates quickly after delivery, recovery time from its effects varies from 6 weeks to 3 months (Artal & Buckenmeyer, 1995; Ohlin & Rossner, 1994). Its effect on connective tissues may continue as long as 5 or 6 months postpartum (Blackburn & Loper, 1992; Calguneri, Bird, & Wright, 1982; Potter & Strauss, 1997). This leaves the postpartum woman open to the possibility of more muscle, joint, and ligament injuries during the time relaxin still affects the body.

Postpartum women suffer more lower extremity pain (especially in the hip and foot) than women who have never been pregnant (Vullo, Richardson, & Hurvitz, 1996). Approximately 50% of pregnant women suffer some lower extremity pain. Plantar faciitis (a painful inflammation associated with connective tissue on the bottom of the foot) may be more prevalent due to the new demands of child care, joint laxity (due to relaxin's effects), and weight gained during pregnancy. In participants studied, their lower extremity pain did not require intensive medical treatment, but did take up to 4 months to resolve in some cases. Anyone who has ever had an infant will attest to the fact that walking with an infant to calm them to sleep is extremely important and the inability to do this would be very disadvantageous to the mother (as her stress level rises while her infant cries in frustration at the mother's lack of movement). Exercise before and during pregnancy was neither a risk factor nor a prophylactic in the occurrence of lower extremity pain. Residual laxity from pregnancy can still be measured 6 weeks after delivery and may contribute to postpartum foot pain (Block, Hess, Timpano, & Serlo, 1985).

In summary, there are multiple physiological changes from pregnancy to postpartum. Those systems that are thought to revert to prior pregnancy function within the first 6 to 8 weeks after delivery are the hemostatic, cardiovascular, renal, and gastrointestinal systems. The cardiovascular system, muscles, joints, and ligaments may take months to revert to prepregnancy function.

Timeframe For Resuming Exercise Postpartum

Although many of the physiological systems may take more than 6 weeks to recover from pregnancy alterations, the type and amount of exercise deemed appropriate after delivery does contain some cultural bias. Although other cultures have women resuming normal activities relatively soon after delivery (George & Berk, 1981), Western literature tends to delineate between activities and exercises that may be resumed immediately after delivery and activities and exercises that are appropriate 6 weeks or more after delivery. There may also be a Western bias that women may not want very much information about exercise right after childbirth as they are "overwhelmed" with the new responsibilities of baby care (Williams & Odoni, 1967).

Most American postpartum women are advised to resume "normal activities" (including exercise) 3 to 6 weeks after their child's birth (George & Berk, 1981; Stover & Marnejon, 1995). If a woman has any concern about when to resume exercise, the most conservative advice is to speak to a physician or someone trained in understanding the potential risks with postpartum exercise prescription (Artal et al., 1989; Ohlin & Rossner, 1994). However, a healthy woman with an uncomplicated vaginal birth can safely begin some forms of resistance exercise immediately after delivery (Stover & Marnejon, 1995). Realistic goals should be set for cosmetic expectations of the results of early resistance exercise, but there are other benefits to beginning them soon after delivery (Ohlin & Rossner, 1994). The faster exercise resumes after tissue injury has occurred, the less muscle atrophy will occur and the sooner normal function will resume (Kegel, 1948). Exercises should be done slowly and deliberately, paying attention to technique so that they are done correctly and do not cause further injury to strained muscles and tissues (ACOG, 1994; Stover & Marnejon, 1995). As muscles may tire easily in the beginning, it is recommended that exercises be performed frequently throughout the day (Findlay & Capes, 1969). It is important to do them often, both to improve muscle strength and tone, as well as forming a healthy lifelong habit (Findlay & Capes, 1969; Kegel, 1948).

Exercises For The Postpartum Period

Exercises For Immediately After Delivery

There are three primary areas that are currently emphasized when exercising immediately postpartum, including the pelvic floor, the abdomen, and the back (Cohen, 1966; Findlay & Capes, 1969; George & Berk, 1981; Ketter & Shelton, 1983; Noble, 1995; Ohlin & Rossner, 1994; Stover & Marnejon, 1995; Williams & Odoni, 1967). Other areas emphasized in the literature used to include exercises for the ankles, the gluteals, and for deep breathing (Cohen, 1966; Findlay & Capes, 1969; Williams & Odoni, 1967). However, now that women are out of bed within a few hours after delivery and/or surgery, these types of exercise are no longer needed (Blackburn & Loper, 1992).

In 1948 Dr. Arnold Kegel identified a method of exercising (today referred to as "kegels") the pelvic floor muscles (or circum vaginal muscles) that allows the perineum to become stronger and even reduces urinary incontinence due to weakened perineal muscles (Kegel, 1948). Based on the "use it or lose it" premise, he describes an exercise where a woman contracts the muscles of the vagina in order to strengthen them. (Dr. Kegel emphasized the importance of exercise that a person completes by their own efforts; passive exercise does not improve muscle function.) Improvement in muscle strength typically occurred within 20 to 40 hours of progressive resistance exercise (progressively squeezing the muscles harder) spread out over 20 to 60 days.

Immediately after childbirth, the two most vulnerable areas to injury are the abdomen and back (May, 1995). The rectus abdominis muscle can be especially vulnerable if it has a diastasis (a splitting of the muscle along its longitudinal center). A diastasis tends to occur as the pregnant uterus stretches the abdominal muscles, however, different women may have more or less separation due to physiological differences of their own bodies (DiFiore & Gaskell, 1993). It is fairly simple to check for this diastasis and either a health care provider or the woman herself can check to see if this condition exists (Noble, 1995). If it does, the diastasis can be closed by exercising the abdominal muscles while holding them together. It is important that abdominal exercises be done carefully until the diastasis has been closed, otherwise injury to the rectus abdominis muscle could result (DiFiore & Gaskell, 1993; Noble, 1995). Once the diastasis has been closed, abdominal crunches can be done to increase abdominal muscle strength and tone and decrease abdominal circumference (Cohen, 1966). Within 24 hours of delivery, pelvic tilts can be started to strengthen abdominals (DiFiore & Gaskell, 1993; Findlay & Capea, 1969; Otman et al., 1989).

The mother's body may not immediately nor automatically resume good posture after compensating for the forward shift in weight and center of gravity of the pregnant uterus (Viadero, 1988). To compound problems, baby care can exceed the amount weakened abdominal and back muscles can handle, causing pain in the low back, shoulder blades, and neck (Viadero, 1988; Williams & Odoni, 1967). Varying degrees of lumbar lordosis continue to exist 6 weeks postpartum whether exercises to strengthen abdominals are performed or not. However, isometric exercises to strengthen abdominal muscles can reduce low back pain (Otman et al., 1989). Although pelvic tilts are recommended for strengthening abdominals, they may also relieve low back pain by aiding the return of good posture (DiFiore & Gaskell, 1993; Findlay & Capea, 1969).

In summary, exercises appropriate for immediately after delivery include exercises for the pelvic floor (perineum), the abdomen, and the back. Exercises must be resumed slowly and attention should be paid to exercise technique to avoid injury.

Exercises For 6 Weeks After Delivery And Beyond

Because different systems in the body recover from pregnancy and delivery at different speeds, the types of exercise undertaken and how soon are a matter of what body area is being exercised. There is no consensus on when the postpartum woman's body has "recovered" from pregnancy and birth. The amount of time a woman is asked to wait to resume exercise varies by how her delivery went and her general state of health (Blackburn & Loper, 1992). Even with this guidance, pain from episiotomy, cesarean surgery, joint laxity, back pain, and abdominal diastasis may linger for weeks and even months. There is consensus that whenever the woman begins that she starts slowly (ACOG, 1994). Variables such as birth complications and prior exercise history can affect how soon and how vigorously exercise may be resumed (Blackburn & Loper, 1992).

Aerobic exercise is the most studied type of exercise for postpartum women (Dewey & McCrory, 1994). Safe and effective forms of aerobic exercise include walking and running (Artal et al., 1989; Capeless & Clapp, 1989; Uzendoski, Latin, Berg & Moshier, 1990; Van Raaij, Schonk, Vermaat-Miedema, Peek, & Hautvast, 1990); cycling (Artal et al., 1989; Jaque-Fortunato, Wiswell, Khodiguian, & Artal, 1996; Lotgering, Spinnewijn, Struijk, Boomsma, & Wallenburg, 1998; Pernoll, Metcalfe, Kovach, Wachtel, & Dunham, 1975; Sady & Carpenter, 1989; South-Paul et al., 1992); aerobic classes

(Bonen, Campagna, & Beresford, 1995; Kolyn & Schultes, 1997; May, 1995; Patience et al., 1998; Sefi, 1987); and swimming (Spinnewijn, Wallenburg, Struijk, & Lotgering, 1996). Although pregnancy itself is a training state (George & Berk, 1991), anytime there has been a decline in physical activity, resumption of that activity should begin slowly and consistently (ACOG, 1994).

There have been no studies specifically on the affects of resistance exercise within the first year after delivery. However, it may be assumed that since resistance exercise at moderate levels is found acceptable during pregnancy, it is safe during the postpartum period (Artal & Buckenmeyer, 1995; Ohlin & Rossner, 1994). Heavy free weights should be avoided as musculoskeletal changes may persist for an extended period of time after delivery (see above discussion for more details). Resistance exercise should also be performed at a moderate pace paying especially close attention to form in order to best work the muscle without becoming injured (DiFiore & Gaskell, 1993). Isometric exercise is an effective and convenient way to begin exercising postpartum (Otman et al., 1989). It does not require equipment and can be performed at home while caring for children.

Due to the new strain to the back and neck muscles from breastfeeding and/or bottle feeding, carrying and cuddling an infant, and stress from adjustment to a new role, the new mother has additional requirements for stretching that include the chest, shoulders, neck and back (Ohlin & Rossner, 1994). Because there are mixed reports of when the effects of relaxin disappear after delivery, any stretches that put undue strain on joints, ligaments, or muscles should be avoided. One advantage to stretching is that it is easy to perform at home on the floor, allowing moms to be close to care for their babies (Sefi, 1987).

In summary, exercises appropriate for beyond 6 weeks after delivery inlcude exercise (walking, running, cycling, aerobic classes, and swimming), moderate resistance exercise, and gentle stretching. As noted previously, exercises should begin slowly and attention paid to technique to avoid injury, especially to the areas that may not have reverted to prepregnancy function: the cardiovascular system, muscles, joints, and ligaments. Because of the possibility of injury, it would be prudent to avoid exercises that put undue stress on these areas or that were controversial in nature.

Exercise Adherence

Barriers To Exercise

When surveyed about their new life-style adjustments, postpartum women had concerns such as a lack of sleep (fatigue), lack of time, need for social support, conflicts between family and their own needs, and return of their prepregnancy figure (Devine et al., 2000; Gjerdingen & Chaloner, 1994; Gruis, 1977; Smith, 1989). Smith studied the most prevalent concerns of primiparae (a woman who has had just one child) and multiparae (a woman who has had more than one child) women. Two of the top concerns from both groups were fatigue and regulating the demands of the family. Gardner and Campbell (1991) reviewed detection of fatigue levels of new mothers up to 6 weeks postpartum and found it to be an extremely common concern that was not always detected by health care providers. Troy, Dalgas-Pelish, and Vichitsukon (1997) found fatigue was one of the highest concerns of first time mothers for the first 6 months postpartum.

One of the most discussed barriers in current adherence literature is the perceived lack of time for exercise (Andrew et al., 1981; DuCharme & Brawley, 1995; Godin et. al., 1994; Godin, Vezina, & Leclerc, 1989; Harrington, 1991; Johnson, Corrigan, Dubbert, & Gramling, 1990; Johnson & Heller, 1998; Klonoff, Annechild, & Landrine, 1994; Leddy, 1997;

Sutherland & Cooper, 1990; Voaklander & Brison, 1991). Leddy conducted adherence research with women who had a history of breast cancer and their perceived barriers to exercise. Through structured interviews and questionnaires she found the primary barriers to exercise were lack of time and inertia. When Klonoff et al. asked a group of women participating in a free aerobic exercise class their primary perceived barriers to exercise, the majority indicated that a lack of time or a lack of money had hindered their pursuit of exercise. A group of cardiac rehabilitation patients indicated lack of time and lack of enjoyment were barriers to continuing exercise (Johnson & Heller, 1998). It may be misleading to take the lack of time as a barrier without delving deeper into just what "lack of time" may really indicate. In a study conducted by McCready and Long (1985), they found that the percent of leisure time available to a person was unrelated to their exercise adherence. Obviously, more work will need to be done in this area.

Working women in our society face not only stressful jobs, but an imbalance in their domestic duties. While many people come home from work exhausted, many women are expected to cook dinner, do laundry, and care for children (Hewitt, 1993). This imbalance of household tasks has a profound affect on women's leisure time. Instead of taking time for themselves, women tend to spend their "free time" on home centered activities (Harrington, 1991; Voaklander & Brison, 1991). Harrington conducted a survey of three occupational groups (university professors, nurses, and administrative assistants) to try and find out what these women were doing in their leisure time. She found even though each of these women had different job duties and responsibilities, the three groups had common leisure time obligations of primary household chores. Gjerdingen and Chaloner (1994) conducted a longitudinal study of working women during their first postpartum year. Women were asked to complete a questionnaire five times during their first postpartum year to ascertain the current status of household roles and division of labor. During the course of the year mothers found themselves not only the primary care giver to their child, but also taking over the majority of the household tasks. Mothers also felt their husbands had reduced their help with household chores and friends and relatives had reduced their emotional and task-oriented support as well. However, women were more likely to feel satisfied with the amount of help they were receiving from their husbands when the women received emotional support and care from them. It appears that there are two factors at work for those women surveyed; the increased time spent on chores with minimal support and a desire for continued emotional support.

According to Duncan, Duncan, and McAuley (1993), men and women need different kinds of support. Females tend to need more emotional support and according to their research, this type of support allows them to better deal with stress. The pairing of exercise and socializing may be a great way for women to combat the stresses of the demands of motherhood. Dishman (1994) found that social support was one of the predictors of continued activity. Erickson and Gillespie (2000) found that conflicts with family needs, time demands, and lack of support were a perfect recipe for nonadherence. In their study of the reasons women stopped participating in an organized fitness program, they found that the majority of those who dropped out of the class were mothers with young children. When the researchers conducted follow up interviews with participants that had dropped out of the exercise program, the participants reported they had "busy schedules, few resources (financial or emotional) and needed extra support to find a way to fit exercise into their daily lives" (p. 5). If her husband or partner is not actively supportive of her pursuit of exercise, a resourceful mother

may have to try and find competent child care outside the home (Devine et al., 2000).

McCready and Long (1985) found that the benefit of stress management was a better predictor of exercise adherence than social support. They also found that factors such as percent of leisure time, family support and previous individual exercise behaviors did not relate to current exercise practices. In a study of both men and women, Gale et al. (1984) found that 62% of those who dropped out of an exercise class were predominantly single men with no children. They also found no strong correlation between number of children at home and exercise adherence of women. It may be that there are different factors that are more important at different times in a woman's life. It is also interesting to note, however, that work site social support (fellow employees), does not appear to help adherence to exercise for either men or women (Telborg, Hibbard, & Glasgow, 1995).

In summary, exercise adherence barriers for postpartum women include lack of sleep (fatigue), lack of time, imbalance in domestic responsibilities, and the need for social support. These barriers are based on postpartum concerns of mothers as well as current literature on barriers to women of childbearing ages.

Other Factors Of Exercise Adherence

A particularly high level of interest of postpartum women (and the focus of this manual) is their concern about the return of their prepregnancy figure and desire to learn more information on exercise (Becker, 1980; Devine et al., 2000; Gruis, 1977; Moran et al., 1997; Smith, 1989). Moran et al. found that after childbirth women wanted to know more information on exercise, as well as diet and nutrition. In Gruis' study of postpartum women, 95% of the respondents indicated that return of their prepregnancy figure was a concern. Gruis also pointed out that although nurses teach about postpartum infant care, they may not address how a mother can go about regaining her prepregnancy shape. Two-thirds of the women surveyed also wanted specific information on diet and exercise, but were reluctant to seek out information from busy health care providers. Devine et al. noted women not only wanted information on exercise, but they wanted to be able to include their infant in their exercise program. The authors indicated incorporating more activities into mother's daily lives would be a way to increase activity in an already busy schedule. Becker recommended that printed matter or guides could better give mothers the information they wanted as well as giving health care providers a consistent source for teaching.

In summary, additional concerns of postpartum women that may affect exercise adherence is the desire for more information on exercise and diet given in verbal discussion with health care providers and in written formats including flyers and pamphlets. These tools may enhance knowledge and in turn increase the possibility of a mother trying an exercise program.

Chapter Two

CHAPTER THREE

CHAPTER THREE

EXERCISE BASICS

Chapter 3 Summary

Basic information on exercise guidelines and definitions is described in this chapter. It is provided as a place to begin learning about exercise without overwhelming the novice exercise enthusiast. There are many texts available that are designed to give much more depth of knowledge on these topics and they should be consulted if more information is desired.

General Exercise Prescription

The American College of Sports Medicine (ACSM) has issued a minimum guideline for maintaining health. The recommendation is to accumulate 30 minutes of moderate physical activity most (if not all) days of the week (Foss & Keteyian, 1998). This standard can be met by simple adjustments in life-style that include modifications such as parking farther away from stores in order to walk more, taking stairs instead of elevators, and riding a bicycle to do short errands. It just takes some life-style analysis and finding creative ways to increase daily activity level.

The F.I.T.T. Principle is an easy way to remember the components of exercise that add up to a quality activity. Each letter stands for an aspect of exercise. "F" stands for the frequency or number of times per week that the exercise should be done. "I" stands for the intensity or how hard the exercise is. Aerobic exercise is measured as a percentage of maximum heart rate. Resistance exercise is measured in terms of sets of reps (repetitions of single movements). "T" stands for the length of time of an individual exercise session. "T" stands for type of exercise. Each of these components are important aspects of an exercise activity that is going to produce a benefit to the exerciser.

When the F.I.T.T. Principle is applied to maintenance of general health, it indicates exercise should be performed daily, at a moderate rate (50-70% of heart rate maximum), for at least 30 minutes, and includes rhythmic usage of the large muscle groups of the body.

General Exercise Guideline

Initially try to complete the progressive resistance exercise program twice a week. As it becomes more a part of a daily routine, add other types of exercise on other days of the week. An especially good complement to the progressive resistance exercise program would be some type of aerobic activity.

Order of a typical exercise session:
- Warm Up
- Stretch I
- Main Exercise
- Cool Down
- Stretch II

Warm Up

The warm up period usually lasts around five minutes and is designed to warm up and loosen the body for exercise. Activities used for a warm up are usually aerobic in nature and are done at a slow to moderate pace. Breaking a sweat is a good indication that the body is warmed up.

Stretch I

The stretch period further readies those muscles that will be used in the main exercise performed that day. Again, this period usually lasts around five minutes.

Main Exercise

This part of the exercise session will last the bulk of the time allotted for exercise.

Cool Down

The cool down period is designed to allow the body to slow back down, allowing breathing and heart rate to return to lower levels after aerobic activity. Movements incorporating large muscle groups (such as slow jogging, walking, and slow spinning on a bicycle) should be continued during this period to prevent blood from pooling in the extremities (which can lead to dizziness and/or fainting). This period lasts for five to ten minutes.

Stretch II

This final period is optional, but may be helpful in reducing muscle soreness due to tension in muscles left over from the previous periods. It can also be a time to relax and meditate for a few minutes, allowing the time to connect and check in with the body.

Stretching Exercise

The ACSM guidelines for stretching and flexibility are:

- **Frequency**
  Two or more days per week (daily is best).
- **Intensity**
  Static stretch sustained for ten to thirty seconds (begin with shorter time and gradually increase by five seconds at a time).
  Three to five reps per exercise.
- **Time**
  Fifteen to thirty minutes total exercise time.
- **Type**
  Stretching.

A warm up exercise should precede stretching to warm up muscles. Stretching without a warm up is like trying to stretch a cold rubber band: it may break instead of stretching. Cold muscles can be more easily injured than warm ones. The stretch movement should be done in a deliberate and controlled manner without bouncing. There will be mild discomfort at peak stretch, but there should not be pain. If pain is experienced, stop the stretch and either determine an alternative that stretches the same area without pain or consult an exercise biomechanist for assistance.

Resistance Exercise

The ACSM guidelines for resistance exercises are:

- **Frequency**
  Two days per week (at least one day between sessions is needed for muscles to recover).
- **Intensity**
  Eight to ten separate exercises that train major muscle groups.
  Eight to twelve reps of each exercise until voluntary fatigue.
  70-80% of 1RM.
- **Time**
  Less than one hour total exercise time.
- **Type**
  Resistance exercise.

Resistance exercise is based on the overload principle. A muscle's strength, endurance, and size will only increase if demands are placed upon it that are harder than the demands normally placed upon it ("overloaded"). Each resistance exercise is described in terms of repetitions ("reps") or the number of each exercise performed, sets or the groups of reps performed, and intensity, measured in the percentage of the

maximum weight that can be lifted just one time (1RM). It is not necessary to find out a 1RM for each exercise; instead, perform each resistance exercise in such a way that only the number of reps within the range outlined in the program can be completed. If more reps can be done than the given range, add resistance until no more than the top of the range can be accomplished. If the minimum reps cannot be done, reduce the amount of resistance until it is possible to complete them. Over time muscles adapt to the resistance lifted and increases in the amount of resistance used will be made periodically in order to stay within the given range of reps. Remember, a good guide on increasing resistance weekly is to increase it by adding no more than 10% of the current resistance. For example, if a five pound weight was used last week, increase by a half of pound for a new total of five and one half pounds for this week.

Retention Of Strength
A distinct advantage to resistance training over aerobic training is that strength gains are relatively easy to maintain. Once the strength or endurance desired is reached, it may be maintained either by doing resistance exercises once per week or a couple of times every few weeks. This is not the same for aerobic conditioning, which declines rapidly without consistent training.

Resistance Exercise Terms
There are many terms used in resistance training. Below are some definitions to clarify some of the most common terms.

Strength
Maximal force from one contraction. It is increased by doing low numbers of repetitions with a high amount of resistance.

Endurance
Ability to persist over long periods of time. It is increased by high numbers of repetitions with a low amount of resistance.

Volume
Number of sets times the number of reps.

Intensity
Percent of 1RM (one rep max).

Power
Work divided by time.

Concentric
Movement in direction of force

Eccentric
Movement in opposite direction of force

Aerobic Exercise

The ACSM guidelines for resistance exercises are:

- Frequency
  Three to five days per week.
- **Intensity**
  60-90% of maximum heart rate.
- **Time**
  20 to 60 minutes.
- **Type**
  Rhythmic and aerobic use of large muscle groups.

Aerobic exercises are those that are rhythmic and use large muscle groups (which is why they work well to music). Aerobic exercise intensity is determined as a percentage of maximum heart rate beats per minute. A simple way of determining maximum heart rate is to subtract current age from 220. For example, someone is 37, then their maximum heart rate would be approximately 183 beats per minute. If they were directed to exercise between 60 and 90% of their heart rate maximum, they would work out between 109 and 165 beats per minute.

The "talk test" is also a way to determine if the exercise intensity is appropriate. Basically, if a conversation cannot be held with someone during the exercise, then the intensity of the exercise may be too high. The talk test may not work for those people who are new to exercising or are resuming exercise after an extended break. In this case the percentage of heart rate maximum method would be a better indicator of intensity.

Another method of determining aerobic intensity is using a scale called the BORG Rating of Perceived Exertion (Borg, 1978). This scale allows someone to indicate how they feel during exercise by rating how hard the exercise feels. Typically, if a zero is added to the numeric value chosen, it will be fairly close to judging the current hear rate. It takes some practice to use the scale, but over time it appears to be a fairly accurate indicator of current heart rate.

The BORG Rating Of Perceived Exertion Scale

6	
7	very, very light
8	
9	very light
10	
11	fairly light
12	
13	somewhat hard
14	
15	hard
16	
17	very hard
18	
19	very, very hard
20	

Aerobic Exercises For Moms

The following are good aerobic exercises that can be done relatively safely while caring for children.

- Brisk walk with stroller or baby carrier
- Jog/run with stroller
- Bicycle with rear child seat or trailer
- A taped aerobic video

There are many other aerobic exercises. Imagination and creativity will help to find what works best for each individual and family.

Exercise Tips

Sensible Shoes

Whenever doing any type of exercise, be sure to have good shoes that are designed for that activity. Good shoes can be the difference between productive workouts and ongoing pain and injury in feet, knees, and back.

Hydration

Drink water often during the work out, before thirst is felt. If appropriate, bring along water for children, too.

Muscular Soreness And Injury

With exercise often comes some amount of soreness. There should be no pain while performing any of the exercises prescribed in this program. There will be some feelings of fatigue when the last few repetitions of a set are completed, however, if pain is felt, immediately stop the exercise. Evaluate if the exercise is being correctly performed or if there is some other cause for the pain. If the problem is not evident, skip the exercise and consult an exercise biomechanist. There is a phenomenon of soreness that occurs one to two days after an exercise session called Delayed Onset Muscle Soreness

(DOMS) (Foss & Keteyian, 1998). The reason DOMS exists is not clear, however, there are a few things that can be done to minimize it. Be sure to begin exercising slowly and gradually increasing the intensity of the workout. A good rule of thumb is increase the intensity no by more than 10% (whether it be mileage or resistance weights) per week. This allows the body to adapt to the new demands placed upon it. Stretching after warming up and after an exercise session may also reduce muscle soreness.

For acute injuries (those that have occurred in a short period of time), rest, ice, compression, elevation, and stretching (RICES) helps tissue recover. Allow the injury to heal by giving the injury adequate rest. How much will depend on the amount of soreness. Consult a health professional if soreness is severe or does not resolve. Icing injuries can be done for both acute and chronic muscle pain. Heat should not be used on acute injuries as it can increase swelling and inhibit healing. Heat can be used a week or so after an injury has occurred to help with rehabilitation.

Chronic injuries occur over a long period of time and may be caused by various sources. Worn out shoes or repeating an exercise without allowing the body to fully heal and adapt to the exercise are common sources of injury. This type of injury should be assessed by a health care professional so long term damage to the body does not result.

CHAPTER THREE

CHAPTER FOUR

CUSTOMIZING THE EXERCISE PROGRAM

Chapter 4 Summary

The specifics of customizing a program are found in this chapter. Information on appropriate resistance, sets, and repetitions for each type of exercise is depicted. Ideas for adherence to the program as well as fun ideas for working out with a child are also described.

Reps, Sets, and Resistance Guidelines

Stretching Exercise Guideline

Reps 3-5 reps held for 10 to 30 seconds.

Sets 1 set of 3-5 reps per exercise (or limb, as appropriate).

Resistance Exercise Guideline

Reps 8-12 until voluntary fatigue (no more can be done). The song listed with each exercise can be used to help keep count of the number of reps completed. For example, if 4 reps are completed during a verse, singing 2 versus means eight reps were completed.

Sets 1 set of 8-10 reps per exercise (or limb, as appropriate).

Determining The Amount Of Resistance To Use

For the first week or so all exercises should be performed with no resistance. This is to allow the body to learn the motion without the additional strain of added weight. Once the exercises have become familiar, the amount of resistance needed for each exercise is based on how many reps can be done until voluntary fatigue. For example, if 20 reps of an exercise can be completed, the resistance is too light and should be increased. If 6 reps can be completed, then the resistance is too heavy and should be decreased. Over time the muscles adapt to the increased resistance and more reps will be possible. When more than 12 reps of a set can be performed, it is time to increase the resistance. Increase the new resistance by adding no more than 10% of the current resistance.

What To Use For Resistance

A child may be the ideal "weight" for a mother's training regimen, depending on what the mother is used to lifting. A child will also increase resistance (gain weight) over time, providing progressive resistance and allowing the mother's strength to continually increase. Please note, if choosing to use a baby, use common sense. Some exercises are not appropriate for a child who does not have head control. If there is any question as to the safety of an exercise for a specific child, please consult a pediatrician.

Standard weights (like those found in a gym or home fitness equipment), resistance bands (these look like large rubber bands and come in a variety of resistances), or even items around the house (water bottles, soup cans, diaper bags) can be used as resistance as long as they allow the exercise to be conducted correctly and safely.

Resistance Exercise Technique

Resistance exercises should be performed in a controlled manner in both directions, paying special attention to speed (not too fast) and technique. Movements should be through a complete range of motion around the moving joint.

Breathe normally during the exercise. Holding the breath and contracting the chest and abdominal muscles (also called the Valsalva maneuver) can lead to an elevation in blood pressure. Exhale during the contraction part of the exercise to avoid breath holding.

Creative Adaptation

The best part of the program is the creativity involved in working with a child. Within the first year of a child's life, there are many milestones each accomplishes. Because the first year is so dynamic, it will make it interesting for a mother to "update" her workout to keep up with her growing child's interests. As children are widely varied in their personalities, different things will work for different mothers and children.

The following are some suggestions to enhance the mother child interactions during the exercise.

- At first, keep the child's involvement simple. Just being around mom is usually a stimulating experience.
- Say or sing the song listed with the exercise. Make up verses with the child's name in it. Since many young children enjoy repetition, sing the same song for all of the exercises if the child enjoys it. Add new songs slowly, one at a time.
- Attach brightly contrasting toys to mother's arms and/or legs so child can watch them as mother exercises.
- Attach small noise makers, such as a bell to mother's arms and/or legs so child can hear them as mother exercises.

Exercise Adherence Assistance

Working out with a friend or workout partner can also provide more motivation to exercise during those times when "you just don't feel like it." As a source of company, encouragement, or maybe even a bit of competition, exercising with other people can help keep the exercise habit going.

The following pages contain a few tools to help with the motivation to continue exercising. The exercise summary sheets contain a small photograph of each exercise and the name of each exercise. This sheet can be photocopied and put on the refrigerator, in a diaper bag, or anywhere else that a few exercises can be conveniently done on the spur of the moment. A basic fitness plan contract is provided with questions on what information needs to be provided, an example of a fitness plan, and a blank fitness plan for photocopying and filling out. Finally, an exercise log sheet containing all of the basic exercises outlined in this manual is provided for those who wish to see their progress over time.


Neck 4 Sides


Arm and Shoulder


Inside of Forearm


Arms & Back I


Arms & Back II


Arms and Chest


Arm and Back


Shoulder and Chest


Chest


Arm Stretch I


Arm Stretch II


Arm Stretch III


Arm Stretch IV


Hip and Thigh


Single Leg I


Single Leg II

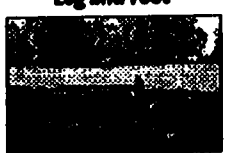

Leg and Foot

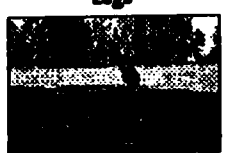

Legs


Inner Thigh


Leg and Hip


Back and Hip


Log


Leg and Back


Back and Hip

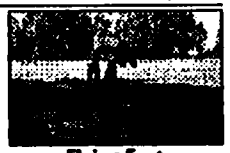

Full Body


Hip Adduction


Hip Abduction


Knee Curl

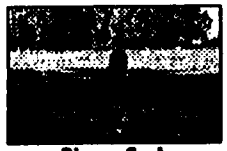

Ankle Ride


Flying Feet


Ankle Raise I & II


Upright Row


Baby Curl


Biceps Curl


Shoulder Shrug

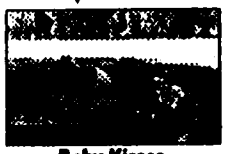

Triceps Extension


Overhead Press


Internal Rotation

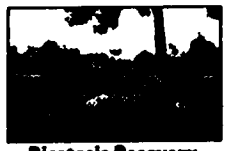

External Rotation


Baby Press

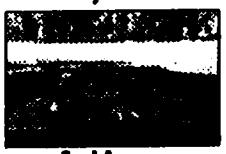

Baby Kisses


Opp. Limb Raise


Neck Isometric I & II


Diastasis Recovery


Curl Up


Curl Across


Pelvic Bridge


Pelvic Floor Training

Today's Date

Fitness Plan for:

My plan is to...
Describe an overall healthful fitness goal.

In order to accomplish this I have set milestones to...
What are the little steps toward the overall healthful goal?

Fitness Plan Benefits
What are the benefits to following through on this plan?

Fitness Plan Rewards
For each milestone set in the exercise plan, determine a reward for each successful accomplishment. This reward need not be extravagant, just something that is a little special, not typically received or done.

Fitness Plan Strategy
What actions will be done to accomplish each milestone?
How will successful completion of an accomplishment be measured?

Overcoming Obstacles
Realize that there are obstacles for anyone setting out to make changes in their life. What are the foreseen obstacles? How can they be overcome when they happen?

I will do all that I can to accomplish the plan I have set for myself.

Sincerely,
Sign your affirmation to your own good health!

June 1, 2000

Example Fitness Plan for Wendy Du Bois

My plan is to...
My plan is to increase my cardiovascular fitness, energy level, and strength.

In order to accomplish this I have set milestones to...
In order to accomplish this I have set 2 milestones:
Begin running again for 45 minutes 3 times per week by September 1, 2000.
Investigate and begin a resistance training program 2 times per week by November 1, 2000.

Fitness Plan Benefits
The benefits I will receive in achieving the milestones I have set include increased physical fitness and energy level for daily living. It should make it easier to chase after and keep up with a toddler!

Fitness Plan Rewards
For each milestone achieved I will reward myself with a new exercise related article of clothing.

Fitness Plan Strategy
In order to accomplish my milestones I will need to begin running 1 to 2 times per week for the first few weeks for 30 minutes, then gradually increase the time running and number of times run per week over the 2 month period I've given myself.
I know I have accomplished my milestones when I am consistently meeting my outlined plan for at least 3 weeks in a row.

Overcoming Obstacles
The obstacles I face are not making the time, not feeling like exercising, and my son not wanting to get in the jog stroller. I will overcome these obstacles by setting aside 1 hour every evening for myself to exercise if I haven't fit it in during the day, finding other people who would like to run with me, and using the jog stroller in the morning when my son is more likely to cooperate.

I will do all that I can to accomplish the plan I have set for myself.

Sincerely,
Wendy Du Bois

Today's Date:

Fitness Plan for:

My plan is to...

In order to accomplish this I have set milestones to...

Fitness Plan Benefits

Fitness Plan Rewards

Fitness Plan Strategy

Overcoming Obstacles

I will do all that I can to accomplish the plan I have set for myself.

Sincerely,

EXERCISE LOG

Pelvic Floor							
Pelvic Bridges							
Curl Across							
Curl Up							
Diastisis Recovery							
Neck Isometrics							
Opp. Limb Raise							
Baby Kisses							
Baby Press							
External Rotation							
Internal Rotation							
Overhead Press							
Tricep Extension							
Shoulder Shrug							
Bicep Curl							
Baby Curl							
Upright Row							
Ankle Raise I & II							
Flying Feet							
Ankle Rides							
Knee Curl							
Hip Abduction							
Hip Adduction							
Stretch							
Aerobic Warm up							
Date							

CHAPTER FIVE

STRETCHING EXERCISES

CHAPTER SEVEN

Front of Neck

Front of Neck
Tilt head back, pointing chin to the ceiling.

Back of Neck
Tilt head forward, placing chin on chest.

Back of Neck

Sternocleidomastoid & Trapezius

Right Side of Neck

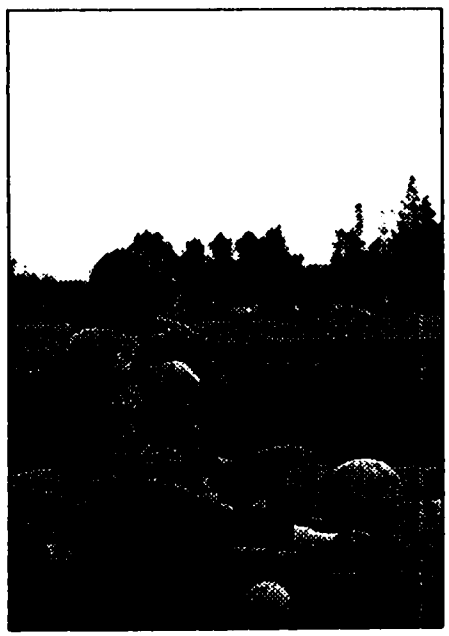
Right Side of Neck
Tilt head to the side, moving left ear toward shoulder.

Left Side of Neck

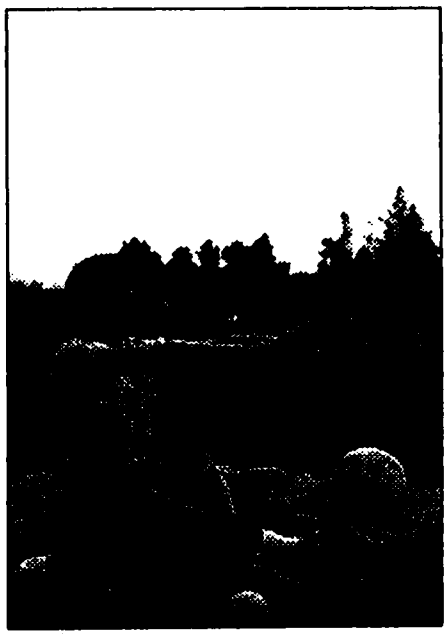
Left Side of Neck
Tilt head to the side, moving right ear toward shoulder.

ARM & SHOULDER EXERCISES

Arm and Shoulder
Pull arm across the body and hold elbow.
Repeat with other arm.



Arm and Shoulder



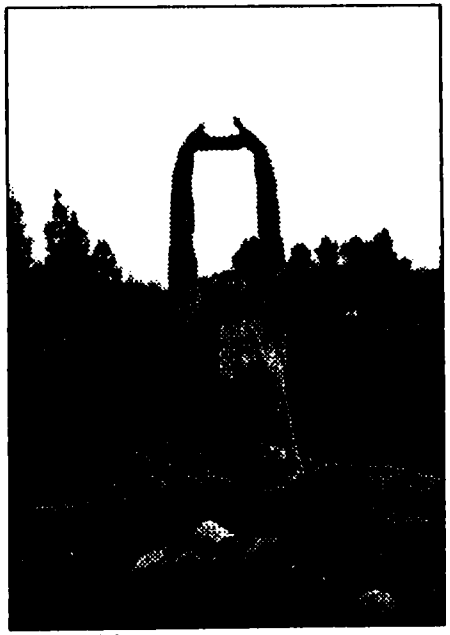
Inside of Forearm

Inside of Forearm
Lace fingers and point palms away from the body.

Arms and Back I

Arms and Back I
Intertwine hands and reach up high.

Arms and Back II
Interlace fingers and point palms upward.
Lean head gently back.



Arms and Back II

ARM & SHOULDER

Arms and Chest
Interlace fingers and face palms away from the body.

Arms and Chest

Arm and Back

Arm and Back
Grab elbow above head with opposite hand and pull for stretch. Repeat with other arm.

Shoulder and Chest

Shoulder and Chest
Grab wrist with other hand behind back and pull for stretch. Repeat with other arm.

Chest
Holding a towel or small blanket behind the body, hold lower arm out straight and allow bent upper arm to pull gently to open and stretch front of chest. Repeat with other arm.

Chest

TRICEPS, BICEPS & PECTORALIS

Arm, Shoulder, Chest & Back

Arm Stretch I
Hold a towel or small blanket wider than shoulder width apart in front of the body.

Arm Stretch I

Arm Stretch II

Arm Stretch II
Continuing to hold onto towel, raise arms overhead.

Arm Stretch III

Arm Stretch III
Gently continue moving arms down behind back.

Arm Stretch IV
Continue arm movement as low as is comfortable

Arm Stretch IV

TRICEPS, DELTOID, PECS & TRAPEZIUS

Hip and Thigh

Hip and Thigh
Push hip of bent leg forward while leaning backward.
Repeat with other leg.
Note: Rear foot should be pointed to reduce strain on knee.

Single Leg I

Single Leg I
Leading with chest, lean forward to stretch back of leg.
Keep back flat.
Repeat with other leg.

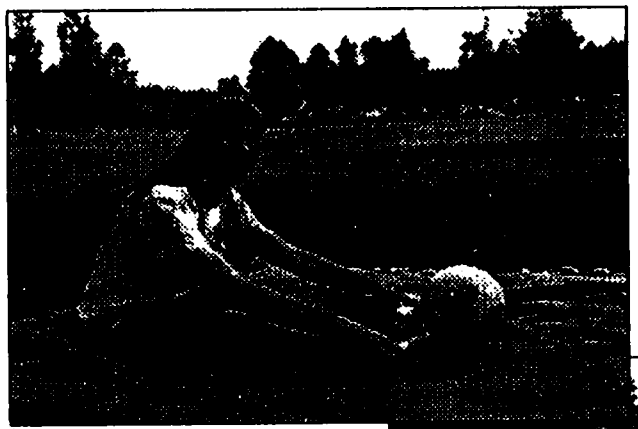
Single Leg II

Single Leg II
Leading with chest, lean forward to stretch back of leg.
Keep back flat.
Reach out and grab toes.
Repeat with other leg.

Leg and Foot
Place foot of bent leg on opposite knee.
Leading with chest, lean forward to stretch back of leg.
Keep back flat.
Reach out and grab bottom of foot to stretch outer leg and foot.
Repeat with other leg.

Leg and Foot

Hip & Buttocks



Legs

Legs
Leading with chest, lean forward to stretch backs of legs.
Keep back flat.

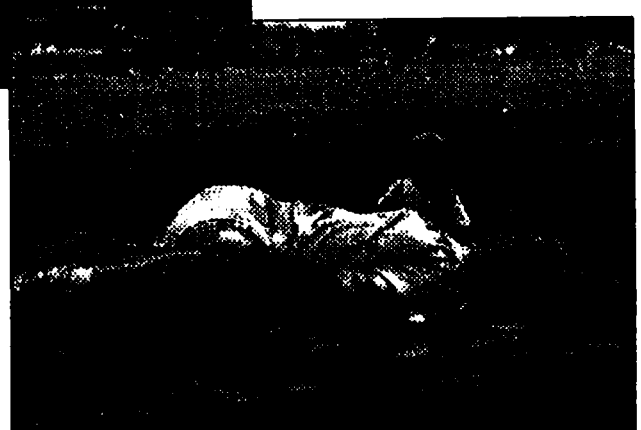
Inner Thigh
Sitting tall, place soles of feet together.
Gently press knees down with hands or elbows to stretch.

Inner Thigh

Ham, Quad, Hip Adductor & Gluts

Leg and Hip

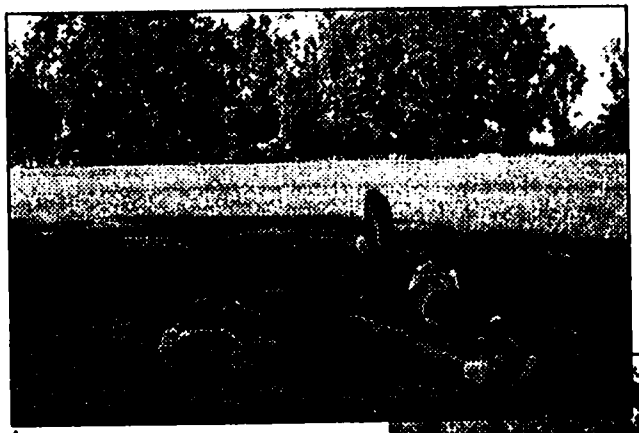
Leg and Hip
On side, bend upper leg and grab foot.
Gently draw foot closer to buttocks.
Repeat with other leg.



Back and Hip

Back and Hip
On back, cross bent leg over the body and hold with opposite hand.
Turn the upper body and other hand away from bent knee.
Repeat with other leg.

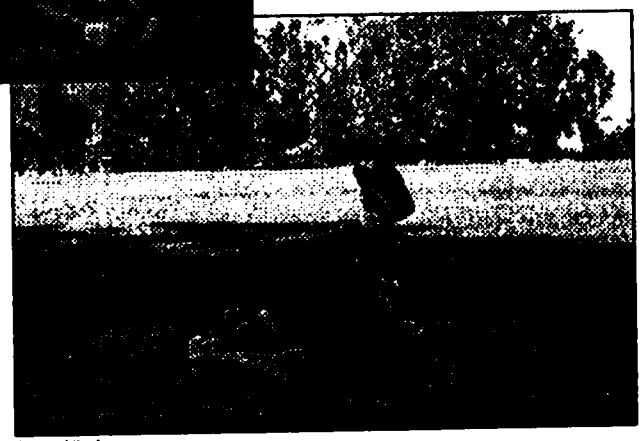
LEG, BUTTOCKS & BACK



Leg

Leg
On back, bend knee toward chest and hold with hands.
Repeat with other leg.
Note: Hold leg under knee to minimize tension on knee joint.

Leg and Back
On back, bend knees toward chest and hold with hands.
Note: Hold legs under knees to minimize tension on knee joints.



Leg and Back

Hamstring, Gluteus Medius & Erector Spinae

Back and Hip

Back and Hip
Cross bent leg over straight leg.
Put opposite elbow on outside of bent knee and turn the upper body into and past bent knee.
Repeat with other leg and arm.

Full Body Stretch

Full Body

Full Body
On back, reach out with arms and legs in opposite directions.

FULL BODY STRETCH

CHAPTER SIX

CHAPTER SIX

RESISTANCE EXERCISES

Hip Adduction

Exercise Notes

Buttocks and feet should remain on the floor throughout the exercise.
This is an isometric exercise. The intensity of this exercise will depend on how hard knees are squeezed together as well as how long they are squeezed.

Down By The Station

Down by the station
early in the morning,
see the little puffer billies
all in a row.

See the engine driver
pull the little handle.
Choo! Choo! Toot! Toot!
Off they go!

Base Position & Movement: Hip Adduction

Base Position

Begin by lying on back.
Knees are bent and held together.
Feet are flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Arms can be at rest along sides of the body on the floor during the exercise.
Place a ball between knees.

Movement

Squeeze inner thighs tightly together.
Hold this position.
Return to base position by slowly relaxing legs.

Hip Abduction

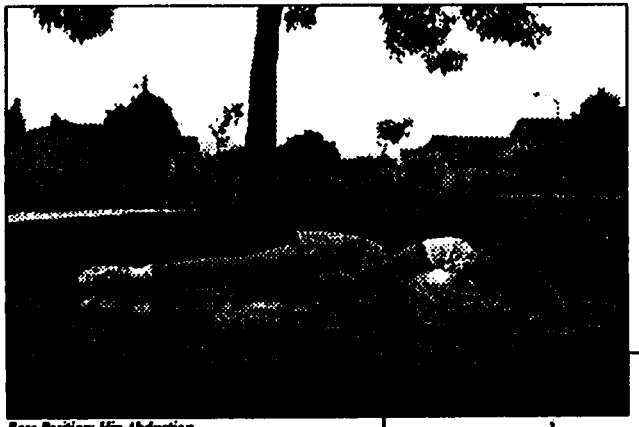
Exercise Notes

Repeat set with left leg.
The foot of leg being raised and lowered should not touch the ground between repetitions.
The body should remain stable while leg is in motion.

Itsy Bitsy Spider

The itsy bitsy spider
went up the water spout.
Down came the rain
and washed the spider out.

Out came the sun
and dried up all the rain.
Then the itsy bitsy spider
went up the spout again.



Base Position: Hip Abduction

Base Position
Begin by lying on left side.
Left leg is bent with knee slightly in front of the body for stability.
Right foot is on top of left foot.
Right hand is placed in front of the body for stability.
Left hand supports head.

Movement: Hip Abduction

Movement
Raise right leg slowly toward ceiling.
Briefly pause at the top of the movement when right leg is raised as high as possible without shifting hips forward or back.
Return to base position by lowering right leg until it is just a few inches above the floor.
Alternate pointing and flexing toe of raised leg with each elevation.

KNEE CURL

Exercise Notes

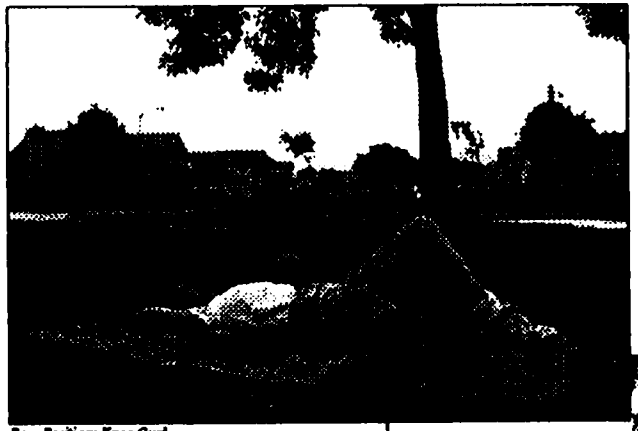
The low back should remain on the floor throughout the exercise.
The body should remain stable while legs are in motion.
Take care not to put strain on neck by pulling up with hands during the exercise.
For a more difficult exercise, return to base position by slowly lowering feet until they are just a few inches above the floor. Continue repetitions without allowing feet to touch the floor.

She'll Be Comin' 'Round The Mountain

She'll be comin' 'round the mountain when she comes,
She'll be comin' 'round the mountain when she comes,
She'll be comin' 'round the mountain,
She'll be comin' 'round the mountain,
She'll be comin' 'round the mountain when she comes.

She'll be drivin' six white horses when she comes,
She'll be drivin' six white horses when she comes,
She'll be drivin' six white horses,
She'll be drivin' six white horses,
She'll be drivin' six white horses when she comes.

Oh, we'll all go out to meet her when she comes,
Oh, we'll all go out to meet her when she comes,
Oh, we'll all go out to meet her,
Oh, we'll all go out to meet her,
Oh, we'll all go out to meet her when she comes.

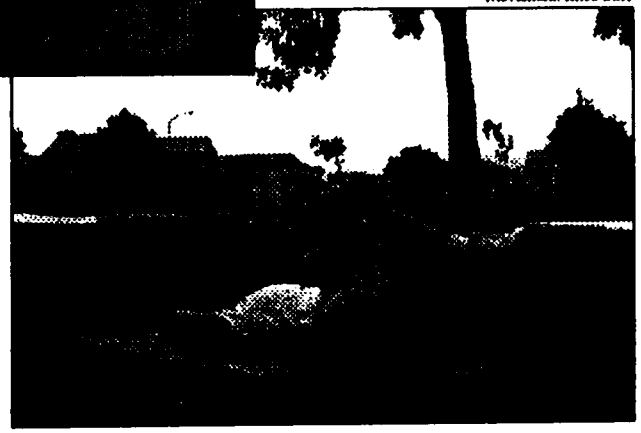


Base Position: Knee Curl

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent and held together.
Feet are flat on the floor and a comfortable distance from buttocks.
Place hands behind head with elbows wide apart.

Movement: Knee Curl



Movement

While keeping stomach tight (pulled in toward spine), slowly raise and draw knees toward chest.
Briefly pause at the top of the movement when knees are as close as possible to chest.
Return to base position by slowly lowering feet to the floor.

KNEE CURL ADVANCED

Exercise Notes

Keep stomach tight (pulled in toward spine) throughout movement.
The low back should remain on the floor throughout the exercise.
The body should remain stable while legs and head are in motion.

She'll Be Comin' 'Round The Mountain

She'll be comin' 'round the mountain
when she comes,
She'll be comin' 'round the mountain
when she comes,
She'll be comin' 'round the mountain,
She'll be comin' 'round the mountain,
She'll be comin' 'round the mountain
when she comes.

She'll be drivin' six white horses when she comes,
She'll be drivin' six white horses when she comes,
She'll be drivin' six white horses,
She'll be drivin' six white horses,
She'll be drivin' six white horses when she comes.

Oh, we'll all go out to meet her when she comes,
Oh, we'll all go out to meet her when she comes,
Oh, we'll all go out to meet her,
Oh, we'll all go out to meet her,
Oh, we'll all go out to meet her when she comes.

Base Position: Knee Curl Advanced

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent and held together.
Feet are a few inches from the floor and a comfortable distance from buttocks.
Balance child (or weight) on lower legs.

Movement: Knee Curl Advanced

Movement

While keeping stomach tight (pulled in toward spine), slowly draw knees toward chest.
Simultaneously raise head and shoulders to meet knees.
Briefly pause at the top of the movement when knees and chin are as close as possible.
Return to base position by slowly lowering feet and head to the floor.

ANKLE RIDES

Exercise Notes

Keep stomach tight (pulled in toward spine) throughout movement.
The low back should remain on the floor throughout the exercise.
The body should remain stable while legs and head are in motion.

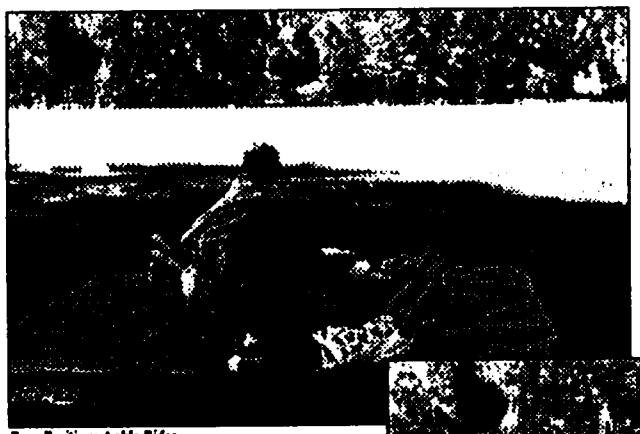
Home On The Range

Oh, give me a home
where the buffalo roam,
where the deer
and the antelope play.

Where seldom is heard
a discouraging word
and the skies are not cloudy all
day.

Home,
home on the range
where the deer
and the antelope play.

Where seldom is heard
a discouraging word
and the skies are not cloudy all
day.



Base Position: Ankle Rides

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent and held together.
Feet are a few inches from the floor and close to buttocks.
Balance child (or weight) on lower legs.

Movement: Ankle Rides

Movement

While keeping stomach tight (pulled in toward spine), slowly raise ankles toward ceiling.
Briefly pause at the top of the movement when knees are straightened as far as possible without dropping child (or weight).
Return to base position by slowly lowering feet to buttocks.

FLYING FEET (LEG PRESS)

Exercise Notes

Keep stomach tight (pulled in toward spine) throughout movement.
The low back should remain on the floor throughout the exercise.
The body should remain stable while legs are in motion.

Pop! Goes The Weasel

All around the cobbler's bench
the monkey chased the weasel.
The monkey that t'was all in fun.
Pop! Goes the weasel.

A penny for a spool of thread,
a penny for a needle.
That's the way the money goes.
Pop! Goes the weasel.

Base Position: Flying Feet (Leg Press)

Base Position

Begin by lying on back with pelvis in a neutral position.
Both knees are bent and close to chest.
Knees and feet are together.
Balance child (or weight) on feet.

Movement: Flying Feet (Leg Press)

Movement

While keeping stomach tight (pulled in toward spine), slowly raise feet toward ceiling.
Briefly pause at the top of the movement when knees are straightened as far as possible without dropping child (or weight).
Return to base position by slowly lowering knees to chest.

Ankle Raise I

Exercise Notes

Repeat set with left leg.
Heel should not touch the ground between repetitions.

Where Has My Little Dog Gone

Oh where,
oh where has be little dog gone?
Oh where,
oh where can he be?

With is tail cut short
and his hair cut long,
oh where,
oh where can he be?

Base Position: Ankle Raise I

Base Position

Begin by standing on right foot with right leg straightened.
Toe of left foot is placed lightly on the ground in back of body for balance.
A hand may be placed on a stationary surface for stability during the exercise. Hold child (or weight) with other hand.

Movement: Ankle Raise I

Movement

With all of the body weight on straightened right leg, rise up on ball of right foot.
Briefly pause at the top of the movement when right foot is raised as high on toes as possible.
Return to base position by lowering body until right heel is near the floor.

Ankle Raise II

Exercise Notes

Repeat set with left leg.
Heel should not touch the ground between repetitions.

Where Has My Little Dog Gone

Oh where,
oh where has be little dog gone?
Oh where,
oh where can he be?

With is tail cut short
and his hair cut long,
oh where,
oh where can he be?

Base Position: Ankle Raise II

Base Position

Begin by standing on right foot with right leg slightly bent.
Toe of left foot is placed lightly on the ground in back of body for balance.
A hand may be placed on a stationary surface for stability during the exercise. Hold weight in hand not placed on surface.

Base Position: Ankle Raise II

Movement

With all of the body weight on slightly bent right leg, rise up on ball of right foot.
Briefly pause at the top of the movement when right foot is raised as high on toes as possible.
Return to base position by lowering body until right heel is near the floor.

Upright Row

Exercise Notes

Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.
The lifted weight should be kept close to the body as it is raised and lowered.
Keep stomach tight (pulled in toward spine) throughout movement.

Row, Row, Row Your Boat

Row, row,
row your boat,
gently down the stream.

Merrily, merrily,
merrily, merrily,
life is but a dream.

Base Position: Upright Row

Base Position
Begin by standing with feet shoulder width apart.
Hold child (or weight) in front of the body.

Movement: Upright Row

Movement
Raise both hands together, pulling toward collar bones (as if standing up rowing a boat).
Briefly pause at the top of the movement when hands are just below collar bone.
Return to base position by lowering hands until arms are extended straight once again in front of the body.

Baby Curl

Exercise Notes

Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.
Keep weight under control- do not use body to "swing" the weight upward, off of thighs as hands are raised.

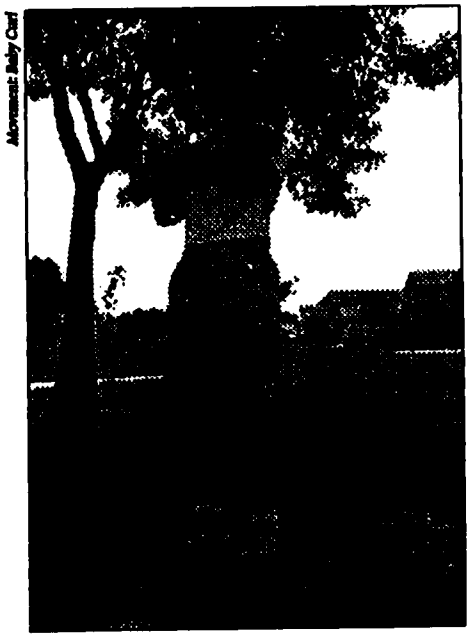
The Muffin Man

Do you know the muffin man,
the muffin man,
the muffin man?
Do you know the muffin man
who lives in Drury Lane?

Yes, we know the muffin man
the muffin man,
the muffin man.
Yes, we know the muffin man
who lives in Drury Lane.

Base Position

Begin by standing with feet shoulder width apart.
Hold child (or weight) in both hands in front of the body.
Palms should be facing away from the body.



Movement

Curl arms together toward chest while keeping upper arms against the body.
Briefly pause at the top of the movement when hands are just below chin.
Return to base position by lowering hands until arms are extended straight once again in front of the body.

BABY CURL ALTERNATE

Exercise Notes

Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.

Keep weight under control- do not use body to "swing" the weight upward, off of thighs as hands are raised.

The Muffin Man

Do you know the muffin man,
the muffin man,
the muffin man?
Do you know the muffin man
who lives in Drury Lane?

Yes, we know the muffin man
the muffin man,
the muffin man.
Yes, we know the muffin man
who lives in Drury Lane.

Base Position: Baby Curl Alternate

Base Position

Begin in a comfortable seated position that allows arms to extend downward in front of the body.
Hold child (or weight) in both hands in front of the body.
Palms should be facing away from the body.

Movement: Baby Curl Alternate

Movement

Curl arms together toward chest while keeping upper arms against the body.
Briefly pause at the top of the movement when hands are just below chin.
Return to base position by lowering hands until arms are extended straight once again in front of the body.

BICEPS CURL

Exercise Notes

Repeat set with right arm.
Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.
Keep weight under control- do not use body to "swing" the weight upward as hands are raised.

The Mulberry Bush

Here we go round the mulberry bush,
the mulberry bush, the mulberry bush.
Here we go round the mulberry bush
so early in the morning.

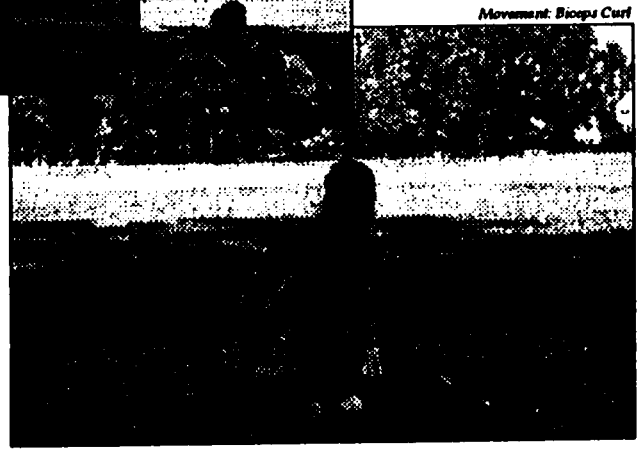
This is the way we wash our clothes
wash our clothes, wash our clothes.
This is the way we wash our clothes
so early in the morning.

This is the way we iron our clothes
iron our clothes, iron our clothes
This is the way we iron our clothes
so early in the morning.

Base Position: Biceps Curl

Base Position

Begin in a comfortable seated position that allows arm to extend downward in front of the body.
Place left elbow on crook of left knee.
Hold weight in left hand in front of the body.
Palm should be facing upward.



Movement: Biceps Curl

Movement

Curl left arm toward chest while keeping elbow against leg.
Briefly pause at the top of the movement when elbow can bend no further.
Return to base position by lowering hand until arm is extended straight once again in front of body.

SHOULDER SHRUG

Exercise Notes

When drawing shoulders up, do so without pinching shoulder blades together or rolling shoulders forward or back.
Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.
The lifted weight should be kept close to the body as it is raised and lowered.

Baa, Baa, Black Sheep

Baa, baa, black sheep,
have you any wool?
Yes, sir, yes, sir,
three bags full.

One for my master
and one for my dame,
and one for the little boy
who lives down the lane.

Base Position: Shoulder Shrug

Base Position

Begin by standing with feet shoulder width apart.
Elbows are held at a slightly bent angle while holding child (or weight) in front of the body.

Movement: Shoulder Shrug

Movement

Keeping elbows frozen, draw shoulders up to ears. Movement will lift arms and weight up.
Briefly pause at the top of the movement when shoulders are as high as they can move.
Return to base position by lowering shoulders until they are fully relaxed.

SHOULDER SHRUG

ALTERNATE

Exercise Notes

When drawing shoulders up, do so without pinching shoulder blades together or rolling shoulders forward or back.
The lifted weight should be kept close to the body as it is raised and lowered.

Baa, Baa, Black Sheep

Baa, baa, black sheep,
have you any wool?
Yes, sir, yes, sir,
three bags full.

One for my master
and one for my dame,
and one for the little boy
who lives down the lane.

Triceps Extension

Exercise Notes

Exercise may also be done with one arm at a time.
Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.

Old King Cole

Old King Cole was a
merry old soul,
and a merry old soul was he.

He called for his pipe,
and he called for his bowl,
and he called for his fiddlers three.

Every fiddler,
he had a fiddle,
a very fine fiddle had he.

Twee-twee diddle-dee,
went the fiddlers three,
and so merry we will be!

Base Position: Triceps Extension

Base Position

Begin in a comfortable seated position.
Hold weights in both hands with palms facing one another.
Arms are bent behind head with elbows next to ears.

Movement: Triceps Extension

Movement

Keeping elbows stationary, raise hands above head.
Briefly pause at the top of the movement when arms are fully extended above head.
Return to base position by lowering hands until elbows are bent once again.

Overhead Press

Exercise Notes

Exercise may also be done with one arm at a time.
Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.

Twinkle, Twinkle, Little Star

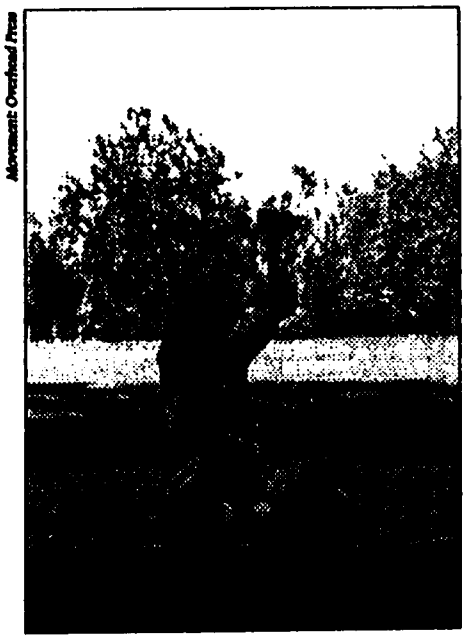
Twinkle, twinkle, little star.
How I wonder what you are!

Up above the world so high,
Like a diamond in the sky.

Twinkle, twinkle, little star.
How I wonder what you are!


Base Position: Overhead Press

Base Position
Begin in a comfortable seated position.
Hold weight in hands on top of shoulders.
Palms should be facing ears.


Movement: Overhead Press

Movement
Straighten arms above head.
Briefly pause at the top of the movement when arms are fully extended above head.
Return to base position by lowering hands until they are once again above shoulders.

INTERNAL ROTATION

Exercise Notes

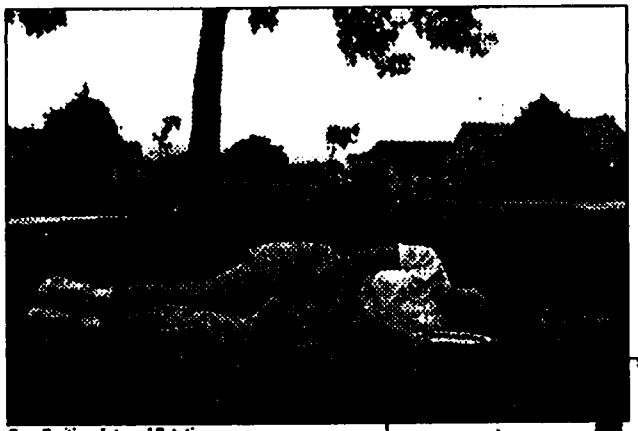
Repeat set on right side using right arm.
The upper part of the moving arm should be slightly in front of body, rather than under it, to allow for arm movement.
Both knees may be drawn up slightly for balance.

Cock-A-Doodle-Doo

Cock-a-doodle-doo!
My dame has lost her shoe,
my master's lost his fiddling stick,
and doesn't know what to do.

Cock-a-doodle-doo!
What is my dame to do?
Till master's finds his fiddling stick,
she'll dance without her shoe.

Cock-a-doodle-doo!
My dame has found her shoe,
my master's found his fiddling stick,
sing do-doodle-do doodle-do.



Base Position: Internal Rotation

Base Position

Begin by lying on left side.
Left arm is relaxed along top of body for balance.
Right arm is positioned with elbow bent at 90° angle, hand in front of body on the floor.
Hold weight in left hand with palm facing the ceiling.

Movement: Internal Rotation

Movement

Raise left hand up and away from floor while keeping upper arm against the body.
The angle of elbow should remain at 90° throughout the movement.
Briefly pause at the top of the movement when left hand reaches right arm.
Return to base position by lowering left hand until it reaches the floor.

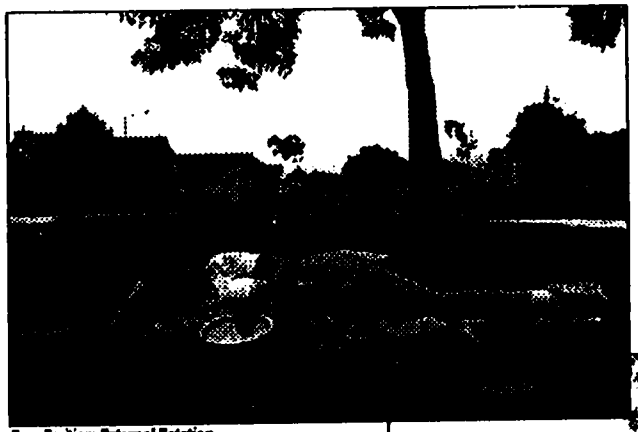
External Rotation

Exercise Notes
Repeat set on left side using right arm.
Both knees may be drawn up slightly for balance.

Pease Porridge Hot

Pease porridge hot,
pease porridge cold,
pease porridge in the pot
nine days old!

Some like it hot,
some like it cold,
pease porridge in the pot
nine days old!



Base Position: External Rotation

Base Position
Begin by lying on right side.
Right hand supports head.
Left arm is positioned with elbow bent at 90° angle, hand in front of the body on the floor.
Hold weight in left hand with palm facing the floor.

Movement: External Rotation

Movement
Raise left hand up and away from floor while keeping upper arm against body.
The angle of elbow should remain at 90° throughout the movement.
Briefly pause at the top of the movement when left hand is raised as high as possible.
Return to base position by lowering left hand until it reaches the floor.

Baby Press

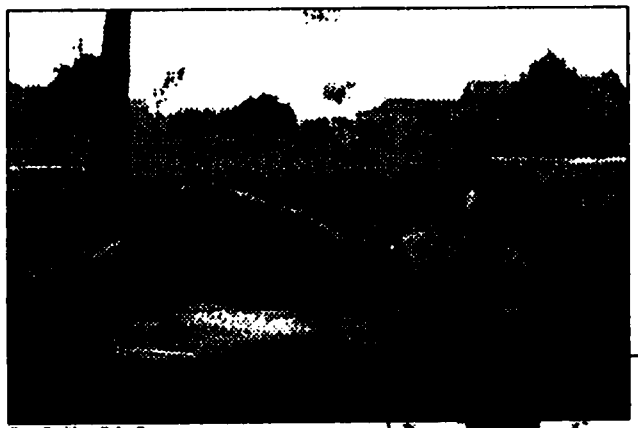
Exercise Notes

Weight should not rest or touch on chest during exercise.
Buttocks and feet should remain on the floor throughout the exercise.
Keep elbows from locking when the arms are straightened. Locking the elbows puts undue stress on the elbow joints.
Keep stomach tight (pulled in toward spine) throughout movement.

The Bear Went Over The Mountain

The bear went over the mountain,
the bear went over the mountain,
the bear went over the mountain,
To see what he could see.

And all that he could see,
and all that he could see,
was the other side of the mountain
other side of the mountain
the other side of the mountain was
all that he could see!

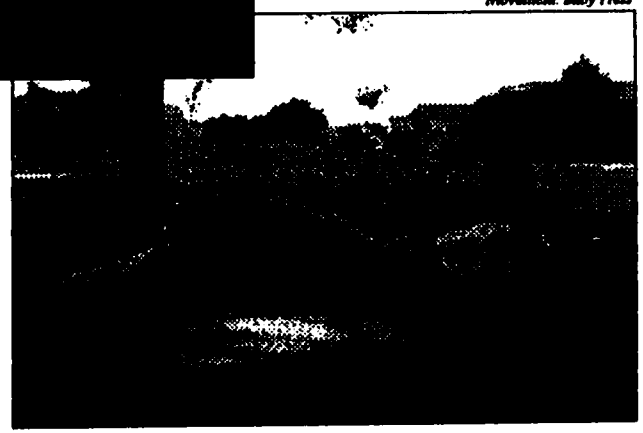


Base Position: Baby Press

Base Position

Begin by lying on back.
Knees are bent.
Feet are flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Hands are shoulder width apart with elbows bent in front of chest, palms toward ceiling.
Hold child (or weight) in hands.

Movement: Baby Press



Movement

Press hands away from chest.
Briefly pause at the top of the movement when arms are fully extended.
Return to base position by lowering hands until elbows are fully bent.

BABY KISSES (PUSH UP)

Exercise Notes

Think of keeping knees, hips, and shoulders in line, moving as one unit. Back should not be arched nor swayed.

Keep elbows from locking when arms are straightened. Locking the elbows puts undue stress on the elbow joints.

Hickory, Dickory, Dock

Hickory, dickory, dock!
The mouse ran up the clock;
The clock struck one,
and down he run,
Hickory, dickory, dock!

Base Position: Baby Kisses (Push Up)

Base Position

Begin by getting on hands and knees on floor.
Knees are slightly apart with ankles comfortably crossed.
Place hands shoulder width apart on floor with arms straight.
Walk hands along floor, away from body so that body weight is shifted toward hands.
Hands are placed directly under shoulders.

Movement: Baby Kisses (Push Up)

Movement

Bend elbows so that the upper body is close to the floor.
Briefly pause at the bottom of the movement when chest is close to the floor without touching it.
Return to base position by slowly extending arms until they are straightened.

Opposing Limb Raise

Exercise Notes

Repeat set using left arm with right leg.
Once they are raised, stretch arm and leg out as if they are being pulled in opposite directions.
Keep stomach tight (pulled in toward spine) throughout movement.
This exercise requires extra balance, so do not be discouraged if it seems awkward at first.

Old MacDonald

Old MacDonald had a farm,
E-I-E-I-O.
And on his farm he had a cow,
E-I-E-I-O.

With a moo-moo here
and a moo-moo there,
here a moo
there a moo
every where a moo moo.

Old MacDonald had a farm,
E-I-E-I-O.

Add additional animals for additional verses.

Base Position: Opposing Limb Raise

Base Position

Begin by getting on hands and knees on floor with pelvis in a neutral position.

Knees are bent, shoulder width apart, and toes are on the floor.

Hands are placed shoulder width apart on floor.

Movement: Opposing Limb Raise

Movement

Slowly raise opposing arm and leg pairs (right arm with left leg) upward until they are outstretched, parallel to the floor.

Pause and hold at the top of the movement when outstretched arm and leg are parallel to the floor.

Return to base position by slowly reversing directions and lowering arm and leg back to the floor.

Neck Isometric I

Exercise Notes

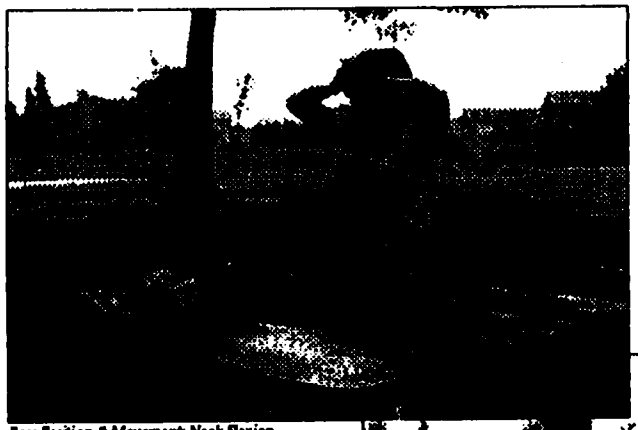
This is an isometric exercise. The intensity of this exercise will depend on how hard head is pushed against hands as well as how long it pushes.

Hey, Diddle, Diddle

Hey, diddle, diddle!
The cat and the fiddle,
the cow jumped over the moon;

The little dog laughed
to see such sport,
and the dish ran away
with the spoon.

STERNOCLEIDOMASTOID & TRAPEZIUS

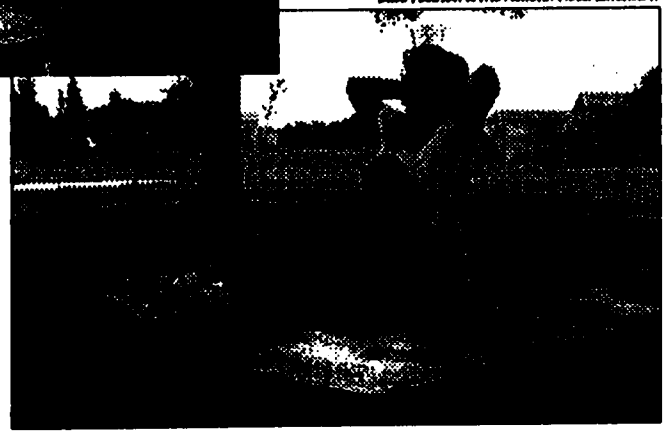


Base Position & Movement: Neck Flexion

Base Position: Neck Flexion
Begin by sitting or standing in a comfortable position.
Place palms on forehead.

Base Position: Neck Extension
Begin by sitting or standing in a comfortable position.
Place palms on back of head.

Base Position & Movement: Neck Extension



Movement
Press head against hands while hands resist the movement.
Hold this position.
Return to base position by relaxing neck muscles.

Neck Isometric II

Exercise Notes

Repeat set on right side.
This is an isometric exercise. The intensity of this exercise will depend on how hard head is pushed against hands as well as how long it pushes.

Alphabet Song

A B C D
E F G
H I J K
L M N O P
Q R S
T U V
W X
Y and Z.
Now I know my A B C's;
Next time won't you sing with me.

Base Position & Movement: Neck Isometric II

Base Position
Begin by sitting or standing in a comfortable position.
Place hands on left side of head, over left ear area.

Movement
Press head against hands while hands resist the movement.
Hold this position.
Return to base position by relaxing neck muscles.

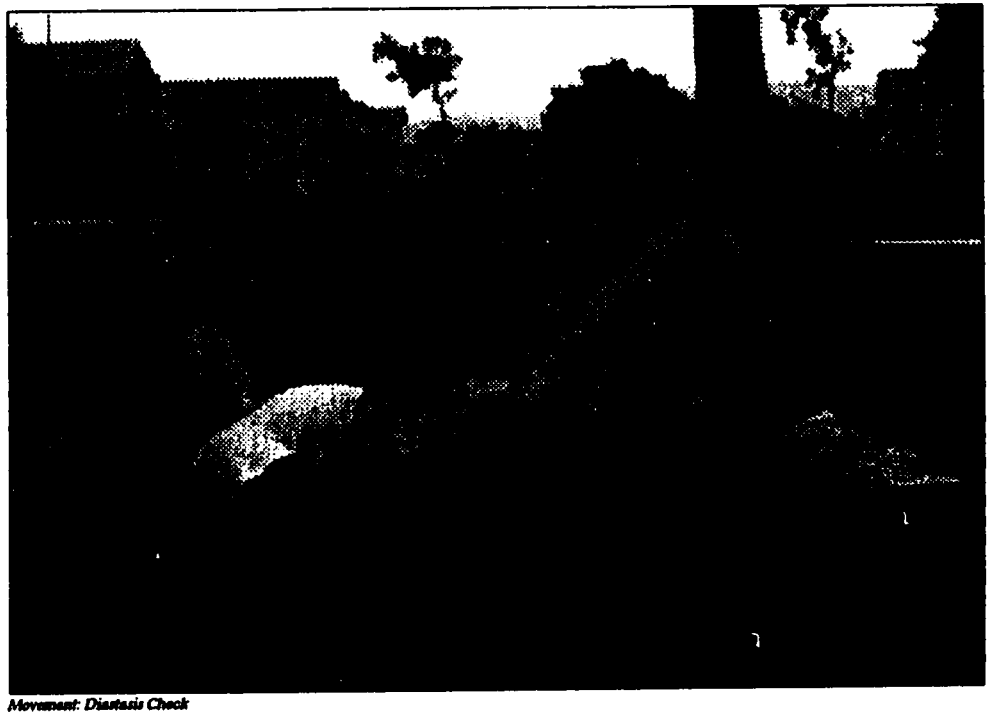
DIASTASIS CHECK

Base Position
Begin by lying on back with pelvis in a neutral position.
Both knees are bent and held together.
Feet are flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Place fingers of one hand in the area of navel.
The gap is measured horizontally within the abdominal muscle.

Movement
While keeping stomach tight (pulled in toward spine), slowly raise head and shoulders upward toward ceiling.
Briefly pause and feel how many fingers fit into any gap that may be present.
Return to base position by slowly lowering head and shoulders back to the floor.

Exercise Notes
A gap of approximately one half inch is normal. Anything larger should be corrected with the Diastasis Recovery Exercise before abdominal and back exercises are begun.

This by no means replaces a medical evaluation conducted by a health care professional. If there are questions or concerns about a specific condition, please consult a health care professional.



Movement: Diastasis Check

RECTUS ABDOMINIS

DIASTASIS RECOVERY

Exercise Notes

Exercise should be done slowly and carefully.
Complete 10 raises per hour 5 times per day until the gap is less than one half inch.
By only raising the head, the recuts abdominis muscle is isolated.

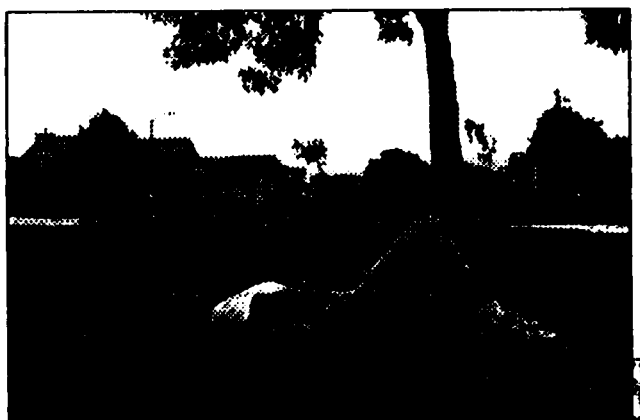
There's A Hole In The Bucket

There's a hole in the bucket,
dear Liza, dear Liza.
There's a hole in the bucket,
dear Liza, a hole!

Well, fix it, dear Henry
dear Henry, dear Henry.
Well, fix it, dear Henry,
dear Henry, fix it!

(Continue as before with the following verses:)

With what shall I fix it?
With a straw, dear Henry.
But the straw is too long.
Then cut it, dear Henry.
With what shall I cut it?
With a knife, dear Henry.
But the knife is too dull.
Then sharpen it, dear Henry.
With what shall I sharpen it?
With a stone, dear Henry.
But the stone is too dry.
Then wet it, dear Henry.
With what shall I wet it?
With water, dear Henry.
In what shall I carry it?
In a bucket, dear Henry.
There's a hole in my bucket...



Base Position: Diastasis Recovery

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent and held together.
Feet are flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Cross arms over waist and place hands on either side of abdomen (this will act as a support to the working muscles).

Movement: Diastasis Recovery

Movement

While keeping stomach tight (pulled in toward spine), slowly raise head upward toward ceiling.
Use hands to pull abdominal muscles together toward the center of the body as head is raised.
Briefly pause while supporting muscles firmly with hands.
Return to base position by slowly lowering head back to the floor.

CURL UP

Exercise Notes

Think of moving chin toward ceiling rather than chin towards knees.
Buttocks and feet should remain on the floor throughout the exercise.
Do not use anything to keep feet immobile as this will encourage the use of other muscles instead of abdominals.

Mary Had A Little Lamb

Mary had a little lamb,
little lamb,
little lamb.
Mary had a little lamb,
its fleece was white as snow.

And everywhere that Mary went,
Mary went,
Mary went,
every where that Mary went
the lamb was sure to go.

It followed her to school one day,
school one day,
school one day,
it followed her to school one day,
which was against the rule.

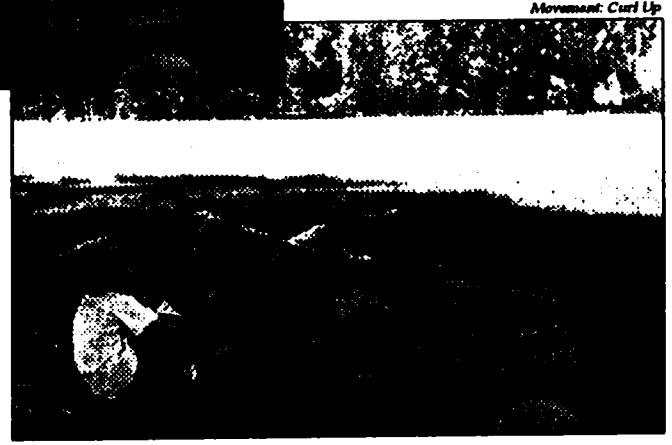
It made the children laugh and play,
laugh and play,
laugh and play,
It made the children laugh and play
to see a lamb at school.

Base Position: Curl Up

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent and held together.
Feet are flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Place hands on tops of thighs.

Movement: Curl Up



Movement

While keeping stomach tight (pulled in toward spine), slowly slide hands up thighs toward knees.
Raise head and most of shoulders off of the floor.
Briefly pause at the top of the movement when the bottom of shoulder blades have almost lifted off of the floor.
Return to base position by slowly reversing directions and sliding hands back down thighs.

CURL UP ALTERNATE

Exercise Notes

Think of moving chin toward ceiling rather than chin towards knees.
Buttocks and feet should remain on the floor throughout the exercise.
Do not use anything to keep feet immobile as this will encourage the use of other muscles instead of abdominals.
Take care not to put strain on neck by pulling up with hands during the exercise.

Mary Had A Little Lamb

Mary had a little lamb,
little lamb,
little lamb.
Mary had a little lamb,
its fleece was white as snow.

And everywhere that Mary went,
Mary went,
Mary went,
every where that Mary went
the lamb was sure to go.

It followed her to school one day,
school one day,
school one day,
it followed her to school one day,
which was against the rule.

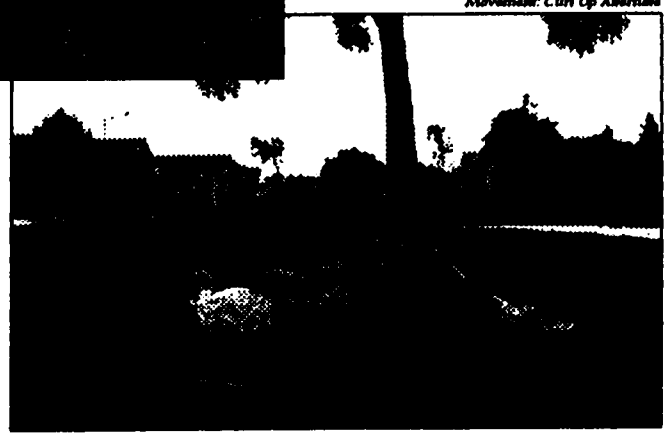
It made the children laugh and play,
laugh and play,
laugh and play,
It made the children laugh and play
to see a lamb at school.

Base Position: Curl Up Alternate

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent and held together.
Feet are flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Place hands behind head with elbows wide apart.

Movement: Curl Up Alternate



Movement

While keeping stomach tight (pulled in toward spine), slowly raise head and tops of shoulders off of the floor.
Briefly pause at the top of the movement when the bottom of shoulder blades have almost lifted off of the floor.
Return to base position by slowly reversing directions and lowering head back to the floor.

CURL ACROSS

Exercise Notes

Repeat set with hands on right thigh.
Buttocks and feet should remain on the floor throughout the exercise.
Do not use anything to keep feet immobile as this will encourage the use of other muscles instead of abdominals.

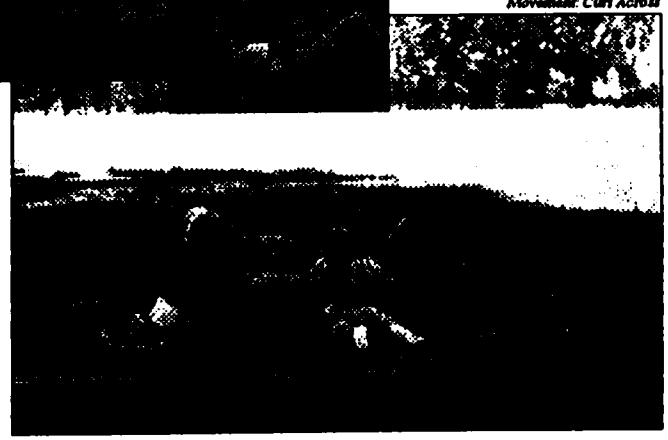
Peanut Sat On A Railroad Track

A peanut sat on a railroad track;
his heart was all a flutter.
Around the bend
came number ten.
Choo! Choo!
Peanut butter.

Base Position: Curl Across

Base Position:

Begin by lying on back with pelvis in a neutral position.
Knees are bent with feet flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Place hands on left thigh.



Movement: Curl Across

Movement

While keeping stomach tight (pulled in toward spine), slowly slide hands toward outside of left knee.
Raise head and tops of shoulders off of the floor.
Briefly pause at the top of the movement when the bottom of left shoulder blade has almost lifted off of the floor.
Return to base position by slowly reversing directions and lowering head back to the floor.

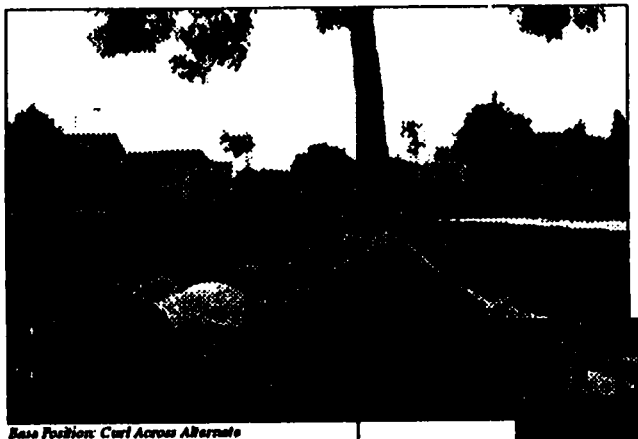
CURL ACROSS ALTERNATE

Exercise Notes

Repeat set with right elbow toward outside of left knee.
Buttocks and feet should remain on the floor throughout the exercise.
Do not use anything to keep feet immobile as this will encourage the use of other muscles instead of abdominals.
Take care not to put strain on neck by pulling up with hands during the exercise.

Peanut Sat On A Railroad Track

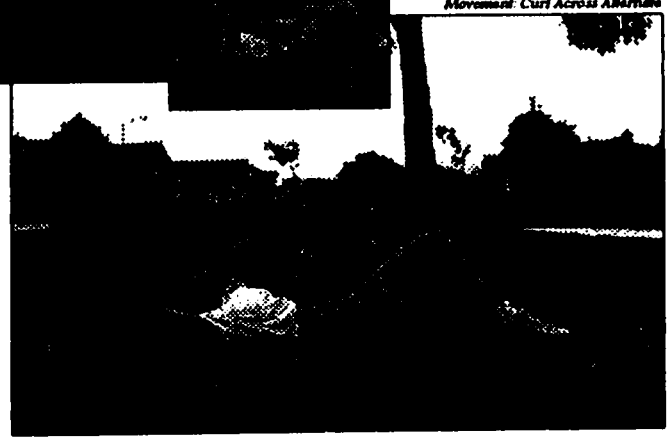
A peanut sat on a railroad track;
his heart was all a flutter.
Around the bend
came number ten.
Choo! Choo!
Peanut butter.



Base Position: Curl Across Alternate

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent with feet flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Place hands behind head with elbows wide apart.



Movement: Curl Across Alternate

Movement

While keeping stomach tight (pulled in toward spine), reach across the body with left elbow toward the outside of right knee.
Raise head and most of shoulders off of the floor.
Briefly pause at the top of the movement when the bottom of right shoulder blade has almost lifted off of the floor.
Return to base position by slowly reversing directions and lowering head back to the floor.

PELVIC BRIDGE

Exercise Notes

Tops of shoulder blades should be in contact with the floor throughout the exercise.

London Bridge Is Falling Down

London Bridge is falling down,
falling down, falling down.
London Bridge is falling down,
my fair lady.

Build it up with iron bars,
iron bars, iron bars.
Build it up with iron bars,
my fair lady.

Iron bars will bend and break,
bend and break, bend and break.
Iron bars will bend and break,
my fair lady.

Build it up with silver and gold,
silver and gold, silver and gold.
Build it up with silver and gold,
my fair lady.

Base Position: Pelvic Bridge

Base Position

Begin by lying on back with pelvis in a neutral position.
Knees are bent and held together.
Feet are flat on the floor, shoulder width apart, and a comfortable distance from buttocks.
Arms can be at rest along sides of the body on the floor during the exercise.

Movement: Pelvic Bridge

Movement

While keeping stomach tight (pulled in toward spine), raise buttocks off of the floor.
Pause and hold at the top of the movement when the bottom of shoulder blades have almost lifted off of the floor.
Return to base position by slowly reversing directions and lowering buttocks back to the floor.

Pelvic Floor Training ("Kegels")

Base Position

The wonderful part about Pelvic Floor Training is that it can be done almost anytime, anywhere. It is fortunate as well because this exercise becomes especially important to postpartum mothers.

Times to remember to do Pelvic Floor Training include:

- while feeding a child
- while stopped at a traffic light
- while watching television (during the commercials)
- while talking on the phone

This is one exercise that can be really creative!

Movement

The easiest way to identify the circum vaginal muscles (those Pelvic Floor Training is designed to work) is to stop and start the flow of urine. It is best to try this only a few times as constant starting and stopping the flow can lead to urinary tract infections.

Once the muscles have been identified, begin flexing the muscles more tightly and deeply. The sensation should start at the anus and move both up and toward pubic bone. The buttocks and abdominal muscles remain relaxed throughout the movement.

Exercise Notes

Begin by doing 10 sets of 10 repetitions of flexing and releasing per day.

Dr. Kegel (the person who identified this type of exercise) recommends upwards of 300 flexing and releasing repetitions per day, so if there is enough time, this would be the ideal number to aim for.

Once the flexing and releasing repetitions become easy, advance to doing 10 sets of 3 repetitions of flexing, holding for the count of 10, then releasing per day. Concentrate on holding the muscle tightly throughout the entire count.

Feeding a child is a great time to do Pelvic Floor Training Exercises.

CIRCUM VAGINAL MUSCLES

CHAPTER SEVEN

References

American College of Obstetrics and Gynecology. (1994). Exercise during pregnancy and the postpartum period. ACOG Technical Bulletin Number 189—February 1994. *International Journal of Gynecology and Obstetrics, 45,* 65-70.

Andrew, G., Oldridge, N., Parker, J., Cunningham, D., Rechnitzer, P., Jones, N., Buck, C., Kavanagh, T., Shephard, R., & Sutton, J. (1981). Reasons for dropout from exercise programs in post-coronary patients. *Medicine and Science in Sports and Exercise, 1,* 164-168.

Artal, M., & Sherman, C. (1998). Exercise is medicine. *The Physician and Sportsmedicine, 26,* 1-3.

Artal, R., & Buckenmeyer, P. (1995). Cover story: Exercise during pregnancy and postpartum. *Journal of Contemporary OB/GYN, 50,* 62-66.

Artal, R., Masaki, D., Khodiguian, N., Romem, Y., Rutherford, S., & Wiswell, R. (1989). Exercise prescription in pregnancy: Weight-bearing versus non-weight-bearing exercise. *American Journal of Obstetrics and Gynecology, 161,* 1464-1469.

Becher, C. (1980). The postpartum period: What is reality? *The Canadian Nurse,* December, 24-27.

Blackburn, S., & Loper, D. (1992). *Maternal, fetal, and neonatal physiology.* Philadelphia: W.B. Saunders.

Block, R., Hess, L., Timpano, E., & Serio, C. (1985). Physiologic changes in the foot during pregnancy. *Journal of the American Podiatry Medical Association, 75,* 297-299.

Bonen, A., Campagna, P., & Beresford, P. (1995). Substrate and hormonal responses during exercise classes at selected stages of pregnancy. Canadian *Journal of Applied Physiology, 20,* 440-451.

Borg, G. (1978). Subjective effort in relation to physical performance and working capacity. In H. J. Pick, H. W. Liebowitz, J. E. Singer, A. Steinschneider, and H. Stevenson (Eds.), *Psychology: From research to practice* (pp. 333-361). New York: Plenum.

Brehm, B. (1989) Helping the postpartum client. *Fitness Management, 5,* 17.

Butte, N., & Hopkinson, J. (1998). Body composition changes during lactation are highly variable among women. *Journal of Nutrition, 128,* s381-s385.

Calguneri, M., Bird, H., & Wright, V. (1982). Changes in joint laxity occurring during pregnancy. *Annals of the Rheumatic Diseases, 41,* 126-128.

Capeless, E., & Clapp, J. (1989). Cardiovascular changes in early phase of pregnancy. *American Journal of Obstetrics and Gynecology, 161,* 1449-1453.

Capeless, E., & Clapp, J. (1991). When do cardiovascular parameters return to their preconception values? *American Journal of Obstetrics and Gynecology, 165,* 883-886.

Carey, G., Quinn, T., & Goodwin, S. (1997). Breast milk composition after exercise of different intensities. *Journal of Human Lactation, 13,* 115-120.

Clapp, J., & Capeless, E. (1991). The VO2 max of recreational athletes before and after pregnancy. *Medicine and Science in Sports and Exercise, 23,* 1128-1133.

Clapp, J., & Little, K. (1995). The interaction between regular exercise and selected aspects of women's health. *American Journal of Obstetrics and Gynecology, 173,* 2-9.

Cohen, J. (1966). And what about exercises. Bulletin of the *American College of Nurse-Midwives, 11,* 5-15.

Danforth, D. (1967). Pregnancy and labor from the vantage point of the physical therapist. *American Journal of Physical Medicine, 46,* 653-658.

Devine, C., Bove, C., & Olson, C. (2000). Continuity and change in women's weight orientations and lifestyle practices through pregnancy and the postpartum period: The influence of life course trajectories and transitional events. *Social Science & Medicine, 50,* 567-582.

Dewey, K. (1998a). Effects of maternal caloric restriction and exercise during lactation. *Journal of Nutrition, 128,* s386-s389.

Dewey, K. (1998b). Maternal body composition, caloric restriction and exercise during lactation: An overview. *Journal of Nutrition, 128,* s379-s380.

Dewey, K., Lovelady, C., Nommsen-Rivers, L., McCrory, M., & Lonnerdal, B. (1994). A randomized study of the effects of aerobic exercise by lactating women on breast-milk volume and composition. *The New England Journal of Medicine, 330,* 449-453.

Dewey, K., & McCrory, M. (1994). Effects of dieting and physical activity on pregnancy and lactation. *American Journal of Clinical Nutrition, 59,* s446-s453.

DiFiore, J., & Gaskell, J. (1993). "Curling and cuddling" abdominal exercises during and after pregnancy. *Midwives Chronicles, 106,* 254-256.

Dishman, R. (1994). Introduction: Consensus, problems, and prospects. In R. Dishman (Ed.), *Advances in exercise adherence* (pp. 1-27). Champaign, IL: Human Kinetics.

DuCharme, K., & Brawley, L. (1995). Predicting the intentions and behavior of exercise initiates using two forms of self-efficacy. *Journal of Behavioral Medicine, 18,* 479-497.

Duffy, L. (1997). Breastfeeding after strenuous aerobic exercise: A case report. *Journal of Human Lactation, 13,* 145-146.

Duncan, T., Duncan, S., & McAuley, E. (1993). The role of domain and gender-specific provisions of social relations in adherence to a prescribed exercise regimen. *Journal of Sport & Exercise Psychology, 15,* 220-231.

Erickson, J., & Gillespie, C. (2000). Reasons women discontinued participation in an exercise and wellness program. *The Physical Educator, 57,* 2-7.

Findlay, E., & Capes, M. (1969). Figure control for your postpartum patient. *RN, 32,* 38-41.

Foss, M., & Keteyian, S. (1998). *Fox's physiological basis for exercise and sport (6th ed.).* Boston: McGraw-Hill.

Gale, J., Eckhoff, W., Mogel, S., & Rodnick, J. (1984). Factors related to adherence to an exercise program for healthy adults. *Medicine and Science in Sports and Exercise, 16,* 544-549.

Gardner, D., & Campbell, B. (1991). Assessing postpartum fatigue. *American Journal of Maternal Child Nursing, 16,* 264-266.

George, G., & , Berk, B. (1981). Exercise before, during, and after pregnancy. *Topics in Clinical Nursing, 2,* 33-39.

Gjerdingen, D., & Chaloner, K. (1994). Mothers' experience with household roles and social support during the first postpartum year. *Women & Health, 21,* 57-74.

Godin, G., Desharnais, R., Valois, P., Lepage, L., Jobin, J., & Bradet, R. (1994). Differences in perceived barriers to exercise between high and low intenders: Observations among different populations. *American Journal of Health Promotion, 8,* 279-286.

Godin, G., Vezina, L., & Leclerc, O. (1989). Factors influencing intentions of pregnant women to exercise after giving birth. *Public Health Reports, 104,* 188-195.

Gruis, M. (1977). Beyond maternity: Postpartum concerns of mothers. *The American Journal of Maternal Child Nursing, 2,* 182-188.

Harrington, M. (1991). Time after work: Constraints on the leisure of working women. *Society and Leisure, 14,* 115-132.

Hart, M., Morton, M., Hosenpud, M., & Metcalfe, J. (1986). Aortic function during normal human pregnancy. *American Journal of Obstetrics and Gynecology, 154,* 887-891.

Hewitt, P. (1993). Flexible working: Asset or cost? *Policy Studies, 14,* 18-28.

Jaque-Fortunato, S., Wiswell, R., Khodiguian, N., & Artal, R. (1996). A comparison of the ventilatory responses to exercise in pregnant, postpartum, and nonpregnant women. *Seminars in Perinatology, 20,* 263-276.

Johnson, C., Corrigan, S., Dubbert, P., & Gramling, S. (1990). Perceived barriers to exercise and weight control practices in community women. *Women & Health, 16,* 177-191.

Johnson, N., & Heller, R. (1998). Prediction of patient nonadherence with home-based exercise for cardiac rehabilitation: The role of perceived barriers and perceived benefits. *Preventive Medicine, 27,* 56-64.

Kegel, A. (1948). Progressive resistance exercise in the functional restoration of the perineal muscles. *American Journal of Obstetrics and Gynecology, 56,* 238-248.

Ketter, D., & Shelton, B. (1983). In-hospital exercises for the postpartal woman. *The American Journal of Maternal Child Nursing, 8,* 120-124.

Klonoff, E., Annechild, A., & Landrine, H. (1994). Predicting exercise adherence in women: The role of psychological and physiological factors. *Preventive Medicine, 23,* 257-262.

Koltyn, K., & Schultes, S. (1997). Psychological effects of an aerobic exercise session and a rest session following pregnancy. *Journal of Sports Medicine and Physical Fitness, 37,* 287-291.

Leddy, S. (1997). Incentives and barriers to exercise in women with a history of breast cancer. *Oncology Nursing Forum, 5,* 885-890.

Little, K., Clapp, J., & Bidson, S. (1994). Effect of exercise on postpartum weight and subcutaneous fat loss. *Medicine and Science in Sport and Exercise, 26,* s15.

Lotgering, F., Spinnewijn, W., Struijk, P., Boomsma, F., & Wallenburg, H. (1998). Respiratory and metabolic responses to endurance cycle exercises in pregnant and postpartum women. *International Journal of Sports Medicine, 19*(3), 193-198.

Lovelady, C., Lonnerdal, B., & Dewey, K. (1990). Lactation performance of exercising women. *American Journal of Clinical Nutrition, 52,* 103-109.

MacLennan, A. (1991). The role of the hormone relaxin in human reproduction and pelvic girdle relaxation. *Scandinavian Journal of Rheumatology, Supplement, 88,* 7-15.

May, A. (1995). Using exercise to tackle postnatal depression. *Health Visitor, 68,* 146-147.

McCready, M., & Long, B. (1985). Locus of control, attitudes toward physical activity, and exercise adherence. *Journal of Sport Psychology, 7,* 346-359.

Moran, C., Holt, V., & Martin, D. (1997). What do women want to know after childbirth? *Birth, 24,* 27-34.

Morin, K., Gennaro, S., & Fehder, W. (1999). Nutrition and exercise in overweight and obese postpartum women. *Applied Nursing Research, 12,* 13-21.

Noble, E. (1995). *Essential exercises for the childbearing year*. Harwich, MA: New Life Images.

Ohlin, A., & Rossner, S. (1996). Factors related to body weight changes during and after pregnancy: The Stockholm pregnancy and weight development study. *Obesity Research, 4*, 271-276.

Otman, A., Beksac, M., & Bagoze, O. (1989). The importance of lumbar lordosis measurement device's application during pregnancy, and post-partum isometric exercise. *European Journal of Obstetrics, Gynecology, and Reproductive Biology, 31*, 155-162.

Parsons C. (1998). Damage to the pelvic floor: Causes, prevention and treatment. *Practicing Midwife, 1*, 14-16.

Patience, T., Dettori, J., & Hoyt, R. (1998). The effect of pregnancy on postpartum fitness in U.S. Army soldiers. *Medicine and Science in Sports and Exercise, 30*, 320.

Pernoll, M., Metcalfe, J., Kovach, P., Wachtel, R., & Dunham, M. (1975). Ventilation during rest and exercise in pregnancy and postpartum. *Respiration Physiology, 25*, 295-310.

Pivarnik, J. (1996). Cardiovascular responses to aerobic exercise during pregnancy and postpartum. *Seminars in Perinatology, 20*, 242-249.

Potter, H., & Strauss, G. (1997). Reproducibility of isokinetic trunk muscle torque evaluation in postpartum women. *Isokinetics and Exercise Science, 6*, 187-196.

Quinn, T., & Carey, G. (1999). Does exercise intensity or diet influence lactic acid accumulation in breast milk? *Medicine and Science in Sports and Exercise, 31*, 105-110.

Sady, M., Haydon, B., Sady, S., Carpenter, M., Thompson, P., & Coustan, D. (1990). Cardiovascular response to maximal cycle exercise during pregnancy and at two and seven months post partum. *American Journal of Obstetrics and Gynecology, 162*, 1181-1185.

Sady, S., & Carpenter, M. (1989). Aerobic exercise during pregnancy. *Sports Medicine, 7*, 357-375.

Sampselle, C., Seng, J., Yeo, S., Killion, C., & Oakley D. (1999). Physical activity and postpartum well-being. *Journal of Obstetric Gynecology Neonatal Nursing, 28*, 41-49.

Schaper, A., Rooney, B., Kay, N., & Silva, P. (1994). Use of the Edinburgh Postnatal Depression Scale to identify postpartum depression in a clinical setting. *Journal of Reproductive Medicine, 39*, 620-624.

Schauberger, C., Rooney, B., Goldsmith, L., Shenton, D., Silva, P., & Schaper, A. (1996). Peripheral joint laxity increases in pregnancy but does not correlate with serum relaxin levels. *American Journal of Obstetrics and Gynecology, 174*, 667-671.

Schelkun, P. (1991). Exercise and breast-feeding mothers. *The Physician and Sportsmedicine, 19*(4), 109-116.

Sefi, S. (1987). Running a postnatal exercise group. *Health Visitor, 60*, 197-198

Smith, M. (1989). Postnatal concerns of mothers: An update. *Midwifery, 5*, 182-188.

South-Paul, J., Rajagopal, K., & Tenholder, M. (1992). Exercise responses prior to pregnancy and in the postpartum state. *Medicine and Science in Sports and Exercise, 24*, 410-414.

Spinnewijn, W., Wallenburg, H., Struijk, P., & Lotgering, F. (1996). Peak ventilatory responses during cycling and swimming in pregnant and nonpregnant women. *Journal of Applied Physiology, 81*, 738-742.

Stephenson, S. (1987). Is there a relationship between prenatal exercise and postp...tum depression. Unpublished master's thesis, University of British Columbia, Vancouver, Canada.

Stover, A., & Marnejon J. (1995). Postpartum care. *American Family Physician, 52*, 1465-1472.

Sutherland, V., & Cooper, C. (1990). Exercise and stress management: Fit employees-healthy organizations? *International Journal of Sport Psychology, 21*, 202-217.

Terborg, J., Hibbard, J., & Glasgow, R. (1995). Behavior change at the worksite: Does social support make a difference? *American Journal of Health Promotion, 10*, 125-131.

Troy, N., Dalgas-Pelish, P., & Vichitsukon. (1997). The natural evolution of postpartum fatigue among a group of primiparous women. *Clinical Nursing Research, 5*, 126-142.

Usendoski, A., Latin, R., Berg, K., & Mosher, S. (1990). Physiological responses to aerobic exercise during pregnancy and post-partum. *Journal of Sports Medicine and Physical Fitness, 30*, 77-82.

Valancogne, G., & Gaisap, J. (1993). Rehabilitation during pregnancy and in the postpartum. *Review of Gynecology and Obstetrics, 88*, 498-508.

Van Raaij, J., Schonk, C., Vermaat-Miedema, S., Peek, M., & Hautvast, J. (1990). Energy cost of walking at a fixed pace and self-paced before, during, and after pregnancy. *American Journal of Clinical Nutrition, 51*, 158-61.

Viadero, A. (1988). Exercise and good postpartum posture. Midwifery Today, 1 (6), 17-19. Vooklander, D., & Brison, R. (1991) Exercise adherence in healthy adult women. *Journal of Human Movement Studies, 20*, 239-247.

Vullo, V., Richardson, J., & Hurvitz, B. (1996). Hip, knee, and foot pain during pregnancy and the postpartum period. *Journal of Family Practice, 43*, 63-68.

Walker, L. (1996). Predictors of weight gain at 6 and 18 months after childbirth: A pilot study. *Journal of Obstetric and Gynecological Neonatal Nursing, 25,* 39-48.

Wallace, J., Ernsthausen, K., & Inbar, G. (1992). The influence of the fullness of milk in the breasts on the concentration of lactic acid in postexercise breast milk. *International Journal of Sports Medicine, 13,* 395-398.

Wallace, J., Inbar, G., & Ernsthausen, K. (1992). Infant acceptance of postexercise breast milk. *Pediatrics, 89,* 1245-1247.

Wallace, J., & Rubin, J. (1991). The concentration of lactic acid in breast milk following maximal exercise. *International Journal of Sports Medicine, 12* (3), 328-331.

Williams, M., & Odoni, J. (1967). Recent advances in ante- and post-natal physiotherapy. *Physiotherapy, 53,* 164-166.

Wright, K., Carey, G., & Quinn, T. (1999). Infant acceptance of breast milk is unaffected by maternal exercise. *Medicine and Science in Sports and Exercise, 31,* s67.

San José State
UNIVERSITY

College of Applied Sciences and Arts

Department of Human Performance

One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Appendix B

AGREEMENT TO PARTICIPATE IN RESEARCH

Responsible Investigator: Wendy L. Du Bois
Title of Protocol: Postpartum Progressive Resistance Exercise Program

Dear Mother,

In creating a postpartum progressive resistance exercise manual for publishing, I would like to use you as a model to illustrate proper resistance exercise techniques. I would like to photograph you and your child/children in a relaxed setting to enhance the appeal of the manual to a broad audience of prospective exercising mothers. During the photo session you will be asked to briefly hold a pose of the start, middle, and end positions of each exercise. The exercises will involve holding your child or a household object (to add weight resistance) as you complete a lifting movement in standing, sitting, and lying-down positions. Enclosed you will find a list of the types of exercises requiring photographs. The photo sessions will be conducted in parks located in Livermore, California as well as in my home in Livermore, California. The sessions will be scheduled for a mutually agreeable time during the summer of 2001.

The foreseeable risks in participating in the photo session are like those inherent in any mild exercise program. To minimize this risk, the pose needed for each photograph will only be assumed for a brief time (long enough to check focus, composition, and snap the picture) and you will be given opportunities to rest between all shots as you (and your child) require.

The foreseeable benefits from participating in the photo session include learning a program of exercises that you may choose to include in your own fitness program and thereby increase your own fitness level. If your photos are chosen for the final manual, you will receive the sum of one hundred dollars and I will be crediting you and your child as models in the photographs. All participants will receive a final copy of the manual in appreciation for their contribution to the project.

No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose not to participate in the project. Your consent to participate has been given voluntarily. You may refuse to participate in the project or in any part of the project. If you decide to participate in the project, you are free to withdraw at any time without prejudice to your relations with San Jose State University.

Questions about this project may be directed to Wendy Du Bois, (925) 456-0263. Complaints about the project may be presented to Dr. V. Gregory Payne, Chair, Department of Human Performance, (408) 924-3010. Questions about research, subjects' rights, or research-related injury may be presented to Nabil Ibrahim, Ph.D., Associate Academic Vice President for Graduate Studies and Research, at (408) 924-2480.

A signed and dated copy of the consent form was received by the participant. The signature of a participant on this document indicates agreement to participate in the study, and for her child, _____, to participate under her care/supervision. The signature of a researcher on this document indicates agreement to include the above named participants in the project and attestation that the participant has been fully informed of her rights.

Participant's Name_____

Participant's Signature_____**Date**_____

Researcher's Signature_____**Date**_____

San José State
UNIVERSITY

College of Applied Sciences and Arts

Department of Human Performance

One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Appendix C

MODEL RELEASE

For and in consideration of my engagement as a model by Wendy Du Bois, hereafter referred to as the photographer, on terms of fee hereinafter stated, I hereby give the photographer, her legal representatives and assigns, those for whom the photographer is acting, and those acting with her permission, or her employees, the right and permission to copyright and/or use, reuse and/or publish, and republish photographic pictures or portraits of me, or in which I may be distorted in character, or form, in conjunction with my own or a fictitious name, on reproductions thereof in color, or black and white made through any media by the photographer at her studio or elsewhere, for any purpose whatsoever; including the use of any printed matter in conjunction therewith.

I hereby waive any right to inspect or approve the finished photograph or advertising copy or printed matter that may be used in conjunction therewith or to the eventual use that it might be applied.

I hereby release, discharge and agree to save harmless the photographer, her representatives, assigns, employees or any person or persons, corporation or corporations, acting under her permission or authority, or any person, persons, corporation or corporations, for whom she might be acting, including any firm publishing and/or distributing the finished product, in whole or in part, from and against any liability as a result of any distortion, blurring, or alteration, optical illusion or in use in composite form, either intentionally or otherwise, that may occur or be produced in the taking, processing or reproduction of the finished product, its publication or distribution of the same, even should the same subject me to ridicule, scandal, reproach, scorn or indignity.

I hereby warrant that I am over twenty-one years of age, and competent to contract in my own name insofar as the above is concerned.

I am to be compensated as follows:

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

I have read the foregoing release, authorization and agreement, before affixing my signature below, and warrant that I fully understand the contents thereof.

Dated _____

Name_____Witness_____

Address_____Address_____

I hereby certify that I am the parent and/or guardian of_____ _____, a child under the age of twenty-one years, and in consideration of value received, the receipt of which is hereby acknowledged, I hereby consent that any photographs which have been or are about to be taken by the photographer may be used by her for the purposes set forth in original release hereinabove.

Parent or Guardian_____

Address _____

Photographer: 1- Fill in terms of employment. 2- Strike out words that do not apply.

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Appendix D

COVER LETTER

For Review of Research

Dear Reviewer,

You have been selected to evaluate a Postpartum Progressive Resistance Exercise Manual. Thank you for taking time out of your busy schedule to complete this evaluation. Your comments and suggestions will facilitate further revisions and improvement in the quality of the manual.

Enclosed please find:

1. Agreement to Participate in Research Review (consent form)
2. A copy of the Postpartum Progressive Resistance Exercise Manual
3. A manual evaluation form
4. Two self-addressed, stamped envelopes

Please sign and date the consent form and return it in one of the self-addressed, stamped envelopes. Then read through the Postpartum Progressive Resistance Exercise Manual, fill out the manual evaluation form, and return the evaluation form in the remaining self-addressed, stamped envelope. I would appreciate it if you would send it to me within 2 weeks of receiving these materials. The manual is yours to keep and use in appreciation for your time. The manual and the evaluations I receive are part of my thesis project to complete a Master's degree in Kinesiology at San Jose State University.

If you have any further questions or are missing any of the materials listed above, please call me, (925) 456-0263 or email me, dubois@advanced-momentum.com.

Sincerely,

Wendy Du Bois

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Appendix E

REVIEWER'S AGREEMENT TO PARTICIPATE IN RESEARCH

Consent Form

Responsible Investigator: Wendy L. Du Bois
Title of Protocol: Postpartum Progressive Resistance Exercise Program

Dear Reviewer,

In creating a postpartum progressive resistance exercise manual, I would like to use your critique of the manual to facilitate further revisions and improve the quality of the manual.

There are no reasonably foreseeable risks or discomforts anticipated by participating in the manual review, and you will receive one copy of the manual in appreciation for your contribution to the project.

The results of the survey may be published, but any information that could result in your identification will remain confidential.

No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose not to participate in the project. Your consent to participate has been given voluntarily. You may refuse to participate in the project or in any part of the project. If you decide to participate in the project, you are free to withdraw at any time without prejudice to your relations with San Jose State University.

Questions about this project may be directed to Wendy Du Bois, (925) 456-0263. Complaints about the project may be presented to Dr. V. Gregory Payne, Chair, Department of Human Performance, (408) 924-3010. Questions about research, subjects' rights, or research-related injury may be presented to Nabil Ibrahim, Ph.D., Associate Academic Vice President for Graduate Studies and Research, at (408) 924-2480.

A signed and dated copy of the consent form was received by the participant. The signature of a participant on this document indicates agreement to participate in the study. The signature of a researcher on this document indicates agreement to include the above named participants in the project and attestation that the participant has been fully informed of his or her rights.

Participant's Name_____

Participant's Signature_____ **Date**_____

Researcher's Signature_____ **Date**_____

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Appendix F

MANUAL EVALUATION

After reading the Postpartum Resistance Exercise Manual, please indicate the degree to which you agree with the statements regarding the content of the manual. Use the 5 point scale to indicate whether you 1 (*strongly agree*), 2 (*agree*), 3 (*disagree*), or 4 (*strongly disagree*). If you feel unable to rate any of the statements, please circle 5 (*not applicable*). Please feel free to include any comments, suggestions, or explanations regarding your responses or about the manual itself either next to the question or numbered on the back of the page. Thank you for taking the time to complete the questionnaire.

Please circle your area of expertise:

obstetrician

early childhood developmentalist

exercise physiologist

exercise biomechanist

Date Evaluation Completed:

_____

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
1. The language in the manual is appropriate for the target audience.	1	2	3	4	5
Comments:					
2. The language used in the manual is clear.	1	2	3	4	5
Comments:					
3. The manual is easy to read.	1	2	3	4	5
Comments:					
4. The manual holds the reader's attention.	1	2	3	4	5
Comments:					
5. The layout of the manual allows ease of access to information.	1	2	3	4	5
Comments:					
6. The manual is organized in a logical manner.	1	2	3	4	5
Comments:					
7. The titles of the subheadings are easily understood.	1	2	3	4	5
Comments:					

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
8. The photographs effectively clarify text descriptions of exercises presented in the manual.	1	2	3	4	5
Comments:					
9. An adequate number of photographs are included in the manual.	1	2	3	4	5
Comments:					
10. Techniques for performing exercises are easy to understand.	1	2	3	4	5
Comments:					
11. Descriptions of exercises provide adequate information for performing the exercises.	1	2	3	4	5
Comments:					
12. The manual adequately covers the topic of postpartum resistance exercise.	1	2	3	4	5
Comments:					
13. I would feel comfortable referring postpartum women to this manual as a source of information on resistance exercise.	1	2	3	4	5
Comments:					
14. I have advised _____ postpartum women I meet with on resistance exercise within the past year.	All	Most	Some	No (None)	Not Applicable
Comments:					

15. Is there any other information that should be included in the manual?

16. Is there any information that should be excluded from the manual?

17. Other comments or suggestions:

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Appendix G

MOTHER EVALUATION

After reading the Postpartum Resistance Exercise Manual, please indicate the degree to which you agree with the statements regarding the content of the manual. Use the 5 point scale to indicate whether you 1 (*strongly agree*), 2 (*agree*), 3 (*disagree*), or 4 (*strongly disagree*). If you feel unable to rate any of the statements, please circle 5 (*not applicable*). Please feel free to include any comments, suggestions, or explanations regarding your responses or about the manual itself either next to the question or numbered on the back of the page.

Thank you for taking the time to complete the questionnaire.

Date Evaluation Completed:

_____

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
1. The manual covers the information I expected.	1	2	3	4	5
Comments:					
2. The manual is easy to read.	1	2	3	4	5
Comments:					
3. The manual holds my attention.	1	2	3	4	5
Comments:					
4. The layout of the manual allows ease of access to information.	1	2	3	4	5
Comments:					
5. The manual is organized in a logical manner.	1	2	3	4	5
Comments:					
6. The titles of the subheadings are easily understood.	1	2	3	4	5
Comments:					
7. The photographs effectively clarify text descriptions of exercises presented in the manual.	1	2	3	4	5
Comments:					

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
8. An adequate number of photographs are included in the manual.	1	2	3	4	5
Comments:					
9. The photographs provide realistic expectations of the exercises.	1	2	3	4	5
Comments:					
10. Techniques for performing exercises are easy to understand.	1	2	3	4	5
Comments:					
11. Descriptions of exercises provide adequate information for performing the exercises.	1	2	3	4	5
Comments:					
12. The manual adequately covers the topic of postpartum resistance exercise.	1	2	3	4	5
Comments:					
13. Exercises appear appropriate for play with my child.	1	2	3	4	5
Comments:					
14. I would try the exercise program outlined in the manual if it were made available to me.	1	2	3	4	5
Comments:					

15. Is there any other information that should be included in the manual?

16. Is there any information that should be excluded from the manual?

17. Other comments or suggestions: