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## Determining the Need for Program Development for Women in Their Childbearing Years

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*University of North Dakota*

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DETERMINING THE NEED FOR PROGRAM DEVELOPMENT FOR WOMEN IN  
THEIR CHILDBEARING YEARS

by

Tami Kae Parker  
Bachelor of Science in Physical Therapy  
University of North Dakota, 2000

An Independent Study

Submitted to the Graduate Faculty of the

Department of Physical Therapy

School of Medicine

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Physical Therapy


Grand Forks, North Dakota

May  
2001



This Independent Study, submitted by Tami Kae Parker in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

  
\_\_\_\_\_  
Faculty Preceptor

  
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Graduate School Advisor

  
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Chairperson, Physical Therapy

PERMISSION

Title                      Determining the Need for Program Development for Women in  
Their Childbearing Years

Department              Physical Therapy

Degree                     Master of Physical Therapy

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## ABSTRACT

The childbearing year for a woman is a time of physical change and adaptation that can potentially result in a variety of musculoskeletal problems. Acting as a clinician, educator, or consultant, physical therapists can offer a variety of services that would benefit women in their childbearing years. Despite the skilled services physical therapists have to offer, this population continues to display prevalent problems. As a result of these existing problems, a survey was constructed to provide direction for program development to promote the health and wellness of women in their childbearing years. The purpose of this study was to develop an understanding of what interventions are currently offered in the Devils Lake and Grand Forks, North Dakota communities to pre and postpartum women and compare it to an ideal treatment protocol addressing pelvic floor muscles, abdominals, posture, scar mobilization, and the cardiovascular system.

A survey was provided to women at their six-week postpartum physician appointment. Criteria included women over the age of 18, and the survey completed within six months of delivery.

Our results consisted of descriptive statistics from the 58 women studied. The most significant problems reported throughout pregnancy were low back pain and stress urinary incontinence (SUI). Sixty one percent of women experienced SUI following an episiotomy, while only 4.3% of these women sought treatment. This common trend, high number of problems experienced with minimal treatment sought, was found throughout

the survey. Other findings in the survey showed that walking was the preferred mode of exercise, and medical doctors and reading materials were most readily used resources.

The childbearing year is a time when the woman is susceptible to injury, and thus a time when dysfunctions could be prevented. Despite the available resources regarding this population, there is a gap in vital information concerning the health and wellness of this population. Through this survey, insight was gained on what issues women are educated on, prevalence of musculoskeletal dysfunctions, and also if treatment was sought. This study has shown the need for physical therapists specializing in women's health to get involved in programming and education of health care providers and women.

## CHAPTER I

### INTRODUCTION

Traditionally, few American physical therapists have been active in obstetric and gynecological care despite the prevalence of musculoskeletal problems associated with childbirth. This lack of involvement, according to Noble, is a key issue because it leaves "significant deficiencies in early prenatal education, which would emphasize the role of body mechanics, postural, and other physical adjustments throughout the childbearing year."<sup>1</sup> Because this population has been overlooked for years, alarming statistics exist supporting Noble's statement including a study by Ostgaard and Andersson.<sup>2</sup> They found low back pain continued to be a problem in 37% of women 18 months following childbirth. Another study reported diastasis recti abdominis occurred as often as 67% during pregnancy and at a rate of 36% in a later postpartum group.<sup>3</sup> A third study found 39% of a sample experienced stress urinary incontinence either before, during, or after pregnancy.<sup>4</sup> It was calculated that the United States spent 11.2 billion dollars annually managing incontinence, excluding nursing home residents.<sup>5</sup> Acting as a clinician, educator, or consultant, physical therapists can offer a variety of services to benefit these overlooked women and are now able to treat numerous complaints previously considered untreatable.

#### **Problem Statement**

Despite all of the research available to expecting mothers, there are still many misconceptions regarding adaptations a women's body must make in order to accomplish

a successful birthing process and recovery. Sadly, many women do not seek treatment for problems when they arise because they assume the changes are a normal, untreatable part of the childbearing process or the issues may be too embarrassing to address. Unfortunately, what these women, and some health care providers do not understand is that by doing a few simple exercises regularly and correctly, the majority of these dysfunctions can be treated and may even be prevented.

Ironically, it is not uncommon for a mother to go to great lengths to ensure the safety and well being of her growing child, but fail to tune in to the needs of her own body. With the demands of work and duties of being a mom, women find little time to prepare and recover properly from childbirth. Some women try to take an active role in their pregnancy because of society's emphasis on the health and well being of a mother and her growing fetus. However, they do not focus on the potential problem areas like the pelvic floor, where changes in these muscles may progressively get worse if not treated promptly and properly. Research shows that up to 80% of women suffer pelvic floor muscle damage during their first vaginal delivery.<sup>6</sup> The American Physical Therapy Association (APTA) Gynecological Manual states, "Though many conditions present clinically later in life, the basis can often be traced back to an obstetric event whose effect has been compounded by further parity and age." This is very alarming to think that ten, even twenty years later a women can still suffer adverse effects of ignored problems resulting from past pregnancies.

### **Purpose of Study**

The purpose of this study is to develop an understanding of what interventions are currently offered, in the Devils Lake and Grand Forks, North Dakota communities, to pre

and postpartum women and compare it to an ideal treatment protocol addressing pelvic floor muscles, abdominals, posture, scar mobilization, and the cardiovascular system. The study was accomplished through a survey and may provide direction for program development to benefit the health and wellness of women in their childbearing years.

### **Significance of Study**

Part of the reason for this lack of awareness is the inadequate knowledge and services available to meet the needs of today's expectant mothers. This survey will help clarify what information mothers are getting during their childbearing years and from where/whom they are receiving this knowledge. After surveying these women, we have better insight regarding issues women are educated on, the prevalence of musculoskeletal dysfunctions, and also if treatment was sought.

Physical therapists and other health care providers can get involved in program development to expand services and information women in their childbearing years receive. It is imperative that services provided to these women be explored in order to prevent future problems women may continue to experience later in life secondary to childbirth. Physical therapists have a knowledge base to treat this clientele and the problems will continue to exist if they are not addressed or treated.

### **Research Questions**

What is the prevalence of musculoskeletal dysfunctions? What is the extent of education of women and health care providers in the investigated communities? Do prenatal programs or health care providers offer education or advise treatment for: 1) Pelvic floor 2) abdominals 3) posture 4) scar management 5) aerobic exercise? Where are

the women receiving their information? What are the women doing for exercise during and after pregnancy?

### **Hypothesis**

The null hypothesis states that there is adequate information and well-established pre and postpartum programs. While the alternate hypothesis determines there is a need for guidelines for a complete and comprehensive pre and postpartum protocol and implementation of these services.

## CHAPTER II

### PELVIC FLOOR

#### Anatomy

As stated in the introduction, the pelvic floor (PF) is a frequently injured area during pregnancy and delivery and is often ignored in the recovery process due to misconceptions that it is a 'part' of the childbearing process. The term pelvic floor is commonly used and refers to the muscles of the pelvic diaphragm. In order to gain a complete understanding of their functional importance, it is imperative that we examine and clarify the anatomy associated with the pelvic floor and its contents.

Four primary muscles constitute the pelvic diaphragm including the puborectalis, pubococcygeus, iliococcygeus, and coccygeus. The pelvic floor is divided into two main muscle groups: levator ani and coccygeus. (Figure 1)

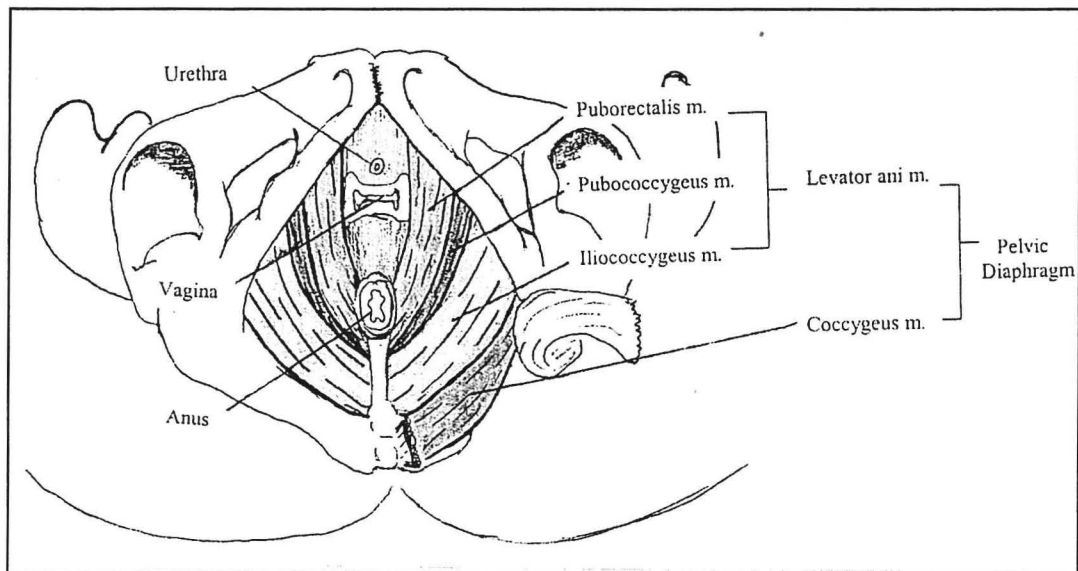


Figure 1. Pelvic Diaphragm

The puborectalis, pubococcygeus, and iliococcygeus muscles collectively are called the levator ani muscle group. Often, there may be a fourth muscle also considered part of the levator ani group called the pubovaginalis whose muscle fibers blend with the vagina.<sup>7(p31),8(p16)</sup> Together, the levator ani muscles and the coccygeus muscle all unite to form a broad muscle that provides support to the floor of the pelvis.

### **Function**

Taking a closer look at each muscle and its specific function provides for a broader understanding of the pelvic floor and how each muscle contributes to the overall function of the pelvic diaphragm. Starting with the levator ani muscles, the puborectalis muscle helps to form a U shape muscular sling around the anus and functions to elevate and assist anal closure.<sup>9-11</sup> The pubococcygeus, considered the main part of the levator ani muscle,<sup>9,12</sup> surrounds the urethra, vagina, and anus. It functions to pull the coccyx forward, elevates all the pelvic organs and compresses the rectum and vagina.<sup>8(p16),9,10</sup> The iliococcygeus muscle is the thin part of the levator ani and pulls the coccyx from side to side and elevates the rectum and vagina.<sup>8(p16)</sup> The pubovaginalis muscle inserts into the perineal body and lateral walls of the vagina, and works as a sphincter of the vagina and urethra.

The coccygeus muscle completes the muscles found in the pelvic diaphragm and assists the levator ani muscles in supporting the pelvic contents.<sup>8(p17),9</sup> It also pulls the coccyx anteriorly to elevate the pelvic floor, and provides stabilization to the sacroiliac joint.

Muscles of the pelvic diaphragm consist of two types of fibers, fast twitch and slow twitch.<sup>13</sup> The fast twitch fibers are active during fast, intense activities such as

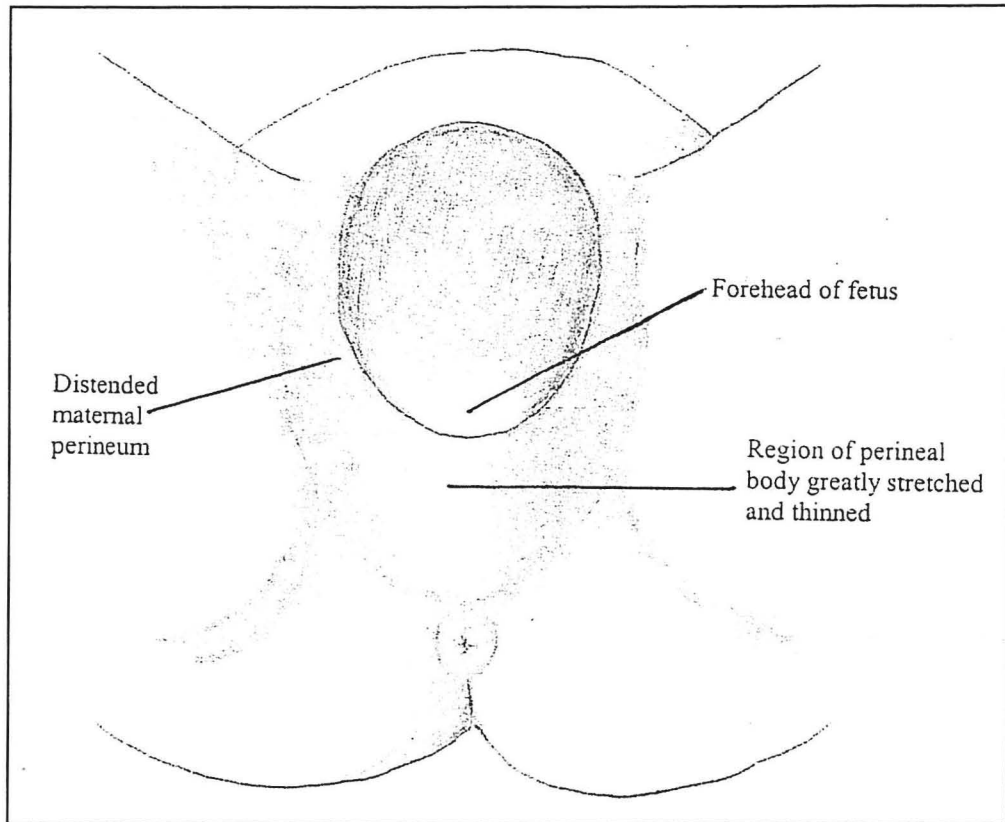


coughing, sneezing, or during any unexpected activities causing increased pressure on the bladder and urethra. Muscles with fast twitch fibers are primarily found in the urogenital diaphragm and sphincter muscles and are used to stop sudden flow of urine. Muscles with slow twitch fibers are primarily found in the pelvic floor and help support the bladder and urethra. Slow twitch fibers are essential here because they contract at a slow, constant rate that is needed for postural support and optimum positions for continence.

### **Effects of Pregnancy**

Noble states that pregnancy and childbirth is the most common cause of pelvic floor laxity.<sup>14(p55,64)</sup> Pregnancy places unusual stresses on the pelvic floor musculature due to the additional weight of the growing fetus, and hormonal changes affecting the muscle and ligamentous integrity. When these muscles become weak, due to increasing weight and hormones, they tend to sag and consequently so do the pelvic contents. This causes less than optimal positions and angles of the pelvic organs, and may possibly lead to dysfunction. This support mechanism has been compared to a hammock<sup>14(p55)</sup> or shelf.<sup>7(p122)</sup> When it is strong it provides support to the pelvic contents, but once weakened, it begins to sag or warp, which fails to provide the essential support needed for proper function.

During labor, the pelvic floor structures are commonly injured due to the passage of the baby's head through the birth canal. This requires enormous elasticity and stretching of the pelvic floor muscles and may result in damaged structures. (Figure 2) The most common damaged muscle is the pubococcygeus, which is of significance because it surrounds and supports the urethra, vagina, and anus.<sup>9</sup>



**Figure 2. Stretching of the perineum during delivery.**

Many women think that the majority of damage to the pelvic floor musculature occurs during a vaginal delivery, which may be true, however, one study indicates these are not the only mothers at risk. Some women who delivered by caesarean section also experienced incontinence due to pelvic floor weakness. This supports the theory of mothers become incontinent due to hormonal changes and nine month's of weight on lax tissues. This study may also suggest that some women have an inherent weakness, prior to pregnancy, predisposing them to incontinence.<sup>15</sup>

### **Associated Problems**

When taking into account the actual process of delivery, it is no surprise when damage occurs to the women's perineum. Research shows that up to 80% of women suffer pelvic floor muscle damage during their first vaginal delivery.<sup>6</sup> These damaged

structures can lead to numerous problems for the mother at the time, and if not properly addressed, in the future. However, it is important to realize that not all pelvic floor problems stem back to a woman's childbearing year, and not all pregnancies will result in future pelvic floor insufficiency.

One of the problems associated with childbirth is urinary incontinence.<sup>14,9(p255),16,17</sup> Urinary incontinence results when there is an involuntary loss of urine that can be associated with anatomical, neurological or unknown etiologies.<sup>18</sup> Stress urinary incontinence (SUI) is the most common pelvic floor problem according to Noble<sup>14(p62)</sup> and occurs with abrupt increases in inter-abdominal pressure during activities such as sneezing, coughing, jumping, or any form of physical exertion. Stress incontinence often is related to multiple vaginal deliveries or pelvic surgery<sup>8(p110)</sup> in which damage to the supportive structures occurs. Some women may experience anal incontinence, especially when a fourth degree tear occurs during childbirth. It is estimated at least 50% Caucasian women suffer from incontinence<sup>14(p59,62)</sup> at some stage of their lives, and many women wait years before addressing these troublesome problems.

Incontinence is not the only consequence of un-addressed pfm. If the muscles are not exercised and returned to normal strength, a woman can suffer prolapse<sup>11</sup> of the pelvic organs. Prolapse occurs when organs such as the uterus, bladder, or rectum descends or falls below normal positions. Pregnancy can directly cause prolapse, which is a result of inadequate pelvic floor muscle support rather than an abnormality of the organ itself.<sup>8(p95)</sup>

Other circumstances affecting proper functioning pelvic floor musculature include episiotomies, tears/lacerations, and hypertonicity. These topics will be further addressed

in the scar section. With these wide ranges of dysfunctions, it is imperative that we find the underlying cause of the problem and not just treat the symptom itself.

### **Benefits to Strengthening**

The pelvic floor musculature is suspended between two bony points, the pubis and coccyx. Strong muscles, aided by fascia and ligaments,<sup>13</sup> provide continual support to the internal organs and their contents against the downward pull of gravity. Adequate pelvic floor strength is able to withstand pressure increases and reliably prevent leakage when performing daily activities such as coughing, laughing, sneezing, lifting, and physical exertion.<sup>13,19</sup> Pelvic floor muscles also function to assist the abdominal muscles when compressing abdominal and pelvic contents. This becomes necessary with activities such as forced expiration, coughing, vomiting, and urinating; and also stabilizes the trunk during strong movements of the upper extremities.<sup>9</sup> Pelvic floor muscles help to maintain urinary/fecal continence and, when toned, enhance sexual function for both partners.<sup>20,21</sup> Other functions consist of support to the vaginal posterior wall, assist in defecation, and pressure relief from the external anal sphincter. In addition, the pelvic floor muscles assist in childbirth,<sup>14(p53)</sup> if no anesthesia is used, by supporting the fetal head while the cervix is dilating.<sup>9</sup>

Looking at the overall function of pelvic floor structure in simpler terms, it plays a vital role in bladder, uterus and bowel control. Elizabeth Noble summarizes the main functions of the pelvic floor. (Figure 3)

### **Benefits to Exercise (Kegel's)**

Beyond supporting the uterus and pelvic contents, exercising the pelvic floor musculature has many benefits throughout pregnancy.<sup>7(p122),14</sup> Developing an awareness

The Five S's:

1. To provide **S**phincter control of your bladder and bowel
2. To **S**upport the pelvic organs and their contents, specifically bladder, uterus and bowel
3. To withstand all the increases in pre**S**sure that occur in the abdomen and pelvis
4. To enhance **S**exual response
5. To help you baby's head **S**lide out during birth

**Figure 3. Elizabeth Noble's Five S's regarding the pelvic floor.**<sup>14(p55-58)</sup>

of these structures during pregnancy is vital so by delivery, the mother is aware of how to relax the appropriate muscles that may prevent extensive tissue damage. Adequate muscle tone also increases blood circulation that improves suppleness of the muscles, and allows for a greater stretch with minimal damage. Furthermore, a healthy, toned pelvic floor may repair at a faster rate after delivery than an unhealthy, untoned pelvic floor. By performing pelvic floor exercises before pregnancy, a greater awareness is gained that will ease the identification and re-education of these muscles following pregnancy.<sup>21</sup>

As pointed out above, the benefits of strong pelvic floor muscles during and following pregnancy are numerous. Elizabeth Noble states "Pelvic floor exercises, above all others, should be part of every program for expectant mothers."<sup>14(p69)</sup> Many authors recommend beginning these exercises as soon as possible during pregnancy, and continuing exercises immediately after delivery, repeating every hour, to minimize muscle wasting and prevent atrophy.<sup>7(p266), 14(p68,70),21</sup> Many women are fearful of starting pelvic floor exercises soon after delivery, due to increased soreness and stress on sutures. However, exercise actually pulls the incision together, not apart, and may soothe

discomfort from any stitches.<sup>14(p69)</sup> Immediate pelvic floor exercise aids healing by increasing circulation to the injured area, bringing primary nutrients while removing any waste products. If exercises are not performed after delivery, muscles may remain stretched and become further weakened when normal activities are resumed, and furthermore, may increase the likelihood of future problems.

### **Exercise Protocol**

When discussing pelvic floor exercises, the distinction must be made between a generalized exercise program and a specific exercise prescription for symptoms of pelvic floor dysfunction. If a dysfunction exists, an assessment must be done by trained personnel to diagnosis the underlying cause, and appropriate treatment then provided. In a non-dysfunctional generalized strengthening and endurance program, the “fabulous five” pelvic floor exercises (commonly known as Kegel’s) can be instructed and performed on a regular basis to ensure healthy, strong support. These include exercises that strengthen both fast-twitch muscle fibers, active during coughing and sneezing, and slow-twitch fibers, which actively support the pelvic floor contents.

Miller et al<sup>17</sup> estimated that 30-50% of women perform pelvic floor exercises incorrectly, and therefore proper instruction is crucial.<sup>14(p64)</sup> It is recommended that women gradually increase both the length of the contraction and the number of repetitions as their strength and endurance increase.<sup>21</sup> Exercise training should begin at an achievable level and progress slowly. A thorough explanation of the “fabulous five” exercises can be found in Appendix A.

Pelvic floor dysfunction continues to be very prevalent in today’s society with the ability to address the majority of these problems with a few key exercises. Physical

therapists have extensive knowledge in assessing and treating musculoskeletal dysfunctions, including the pelvic area, and should be utilized appropriately. There are many reasons limiting physical therapy use, including women's lack of awareness that these issues are treatable problems, if not preventable. A comprehensive attempt to address this area needs to occur in order for substantial improvements to be seen associated with pregnancy.

## CHAPTER III

### ABDOMINALS

#### **Anatomy**

The function of the abdominal musculature during pregnancy has been of interest to physical therapists because of its role in aiding postural alignment and trunk stability, and its involvement in the second stage of labor.<sup>21</sup> A good understanding of the abdominal muscles is essential in order to gain an appreciation for this important role throughout pregnancy. When discussing the abdominal muscles, focus is placed on the anterior portion due to the stresses it endures during pregnancy<sup>7(p16)</sup> from the expanding uterus. Four primary muscles involved are: external and internal oblique, transverses abdominis, and rectus abdominis. These muscles extend between the thoracic cage and bony pelvis,<sup>9</sup> attaching to parts of the sternum, ribs and pelvic bones.

The largest and most superficial muscle is the external abdominal oblique, which is located on the anteriolateral trunk. The muscle fibers run from the lower ribs, in a diagonally downward direction, down to the pubic bone. Located underneath the external oblique, lie the internal abdominal oblique muscle. The internal oblique muscle fibers run opposite of the external oblique muscles and form right angles between the two. The transversus abdominis muscle is the innermost of the four muscles and the majority of these muscle fibers run horizontally. The fourth muscle, the rectus abdominis, is a long broad strap muscle and runs vertically from the pelvic bone to the sternum and is bisected into separate halves by a complex tendonous band called the linea alba.<sup>9,22</sup> The linea alba



is a meeting point made up of the aponeuroses of the external/internal obliques and transversus abdominis muscles, which form a sheath around the rectus abdominis before their tendon fibers insert into the linea alba.<sup>23</sup>

### **Function**

Aside from protecting the abdominal contents, these muscles form a corset-like support mechanism to provide stability to the pelvis and trunk. Both external and internal obliques, as well as the transversalis abdominis, serve to protect the abdominal viscera and compress abdominal contents essential in raising intra-abdominal pressure during forced expiration activities such as laughing, coughing, sneezing, vomiting, and straining. These muscles also create the force required for proper bowel/bladder elimination and are active during the second stage of childbirth. When examining each muscle as a separate structure, these muscles assist in flexing, rotating, and side bending the trunk.<sup>9</sup> Looking at the role of the rectus abdominis, it too functions to compress abdominal viscera, but in addition, it depresses the ribs and stabilizes the pelvis during walking. This stabilization is of extreme importance because it allows the lower extremities to function effectively.

Additional functions of the abdominals<sup>14(p82)</sup> include: maintaining proper positions of abdominal and pelvic organs, controlling the angle of the pelvis, and bracing the body during activities such as lifting.

### **Effects of Pregnancy**

One of the greatest adaptations a woman's body makes during pregnancy is the gross stretching of the abdominal wall. Prior to pregnancy, the uterus weighs about 60 grams and is able to hold six milliliters of fluid.<sup>24</sup> At full term, the uterus weight increases to one kilogram and its capacity increased to hold 5000 milliliters! This gross

enlargement of the uterus is able to occur due to the ability of the abdomen to stretch and “make room” for the growing fetus. Stretching capabilities are primarily due to the increased level of hormones that occurs during pregnancy, causing the connective tissue that encompasses the abdominal muscles to ‘loosen.’<sup>25</sup> The combination of hormones and fetus size leaves a very unstable support mechanism because of the inability of abdominal structures to generate the necessary tension needed, leaving the body vulnerable for increased risk of injury.

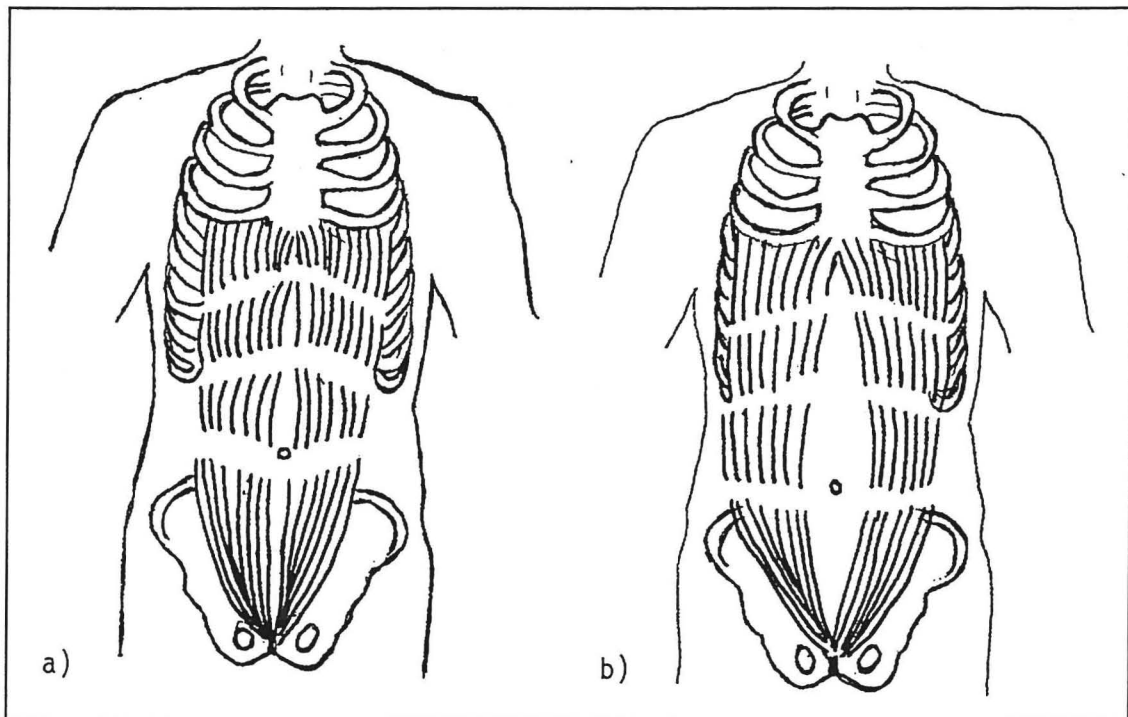
### **Importance During Pregnancy**

In the past, the focus of the abdominal role during pregnancy has been mainly on that of the rectus abdominis. Concentric exercises to strengthen have been advocated during early stages of pregnancy, but then ignored in later months, due to the extreme stretching of the rectus abdominis, creating great mechanical disadvantage. Therefore, strengthening during the later stages of pregnancy have been ignored and considered impractical. Current literature has found that trunk stability in the non-pregnant population results from internal and external oblique activity, as well as the transversus abdominis.<sup>26</sup> However, further research must be done in order to correlate these results in the pregnant population. Nevertheless, due to the lengthening rectus abdominis and the importance of an isometric co-contraction to achieve lumbosacral stability, it is essential to focus on the abdominal group as a whole when prescribing an exercise program during pregnancy.<sup>21</sup>

### **Diastasis Recti**

As a result of hormonal softening and anatomical stretching, a splitting of the linea alba in the rectus abdominis muscle may result.<sup>21,22</sup> (Figure 4) Noble compares this

to a zipper or seam in a piece of fabric,<sup>14(p89)</sup> which when under great stress, will split at the greatest point of tension or weakness. This splitting is known as diastasis recti abdominis and is often detected postnatally or in the last months of pregnancy. Some authors state an estimated 50-60% of women suffer from diastasis recti abdominis immediately postpartum.<sup>22</sup> Commonly, this diminishes by the fourth week postpartum, but usually does not recover entirely until the eighth week.<sup>27</sup>



**Figure 4. Diastasis recti of abdominal muscles. a) normal b) diastasis recti.**

Diastasis recti may be slight or severe within the pregnant population. Herniation of the abdominal viscera can occur with large separations,<sup>12,14,28</sup> which may compromise any of abdominal wall functions including: posture role, trunk stability, respiration, delivery of fetus, and trunk flexion, rotation, and side bending.<sup>22</sup> Diastasis recti may also affect the lumbosacral fascia, which in turn compromises lumbar spine support and results in unstable insertion attachments for the abdominal muscles.<sup>29</sup> Any time the angle

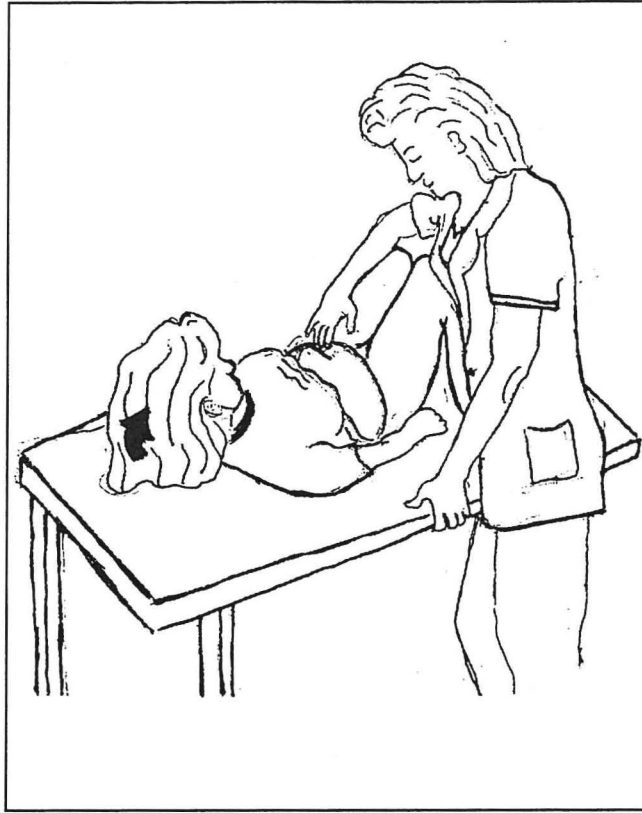
of insertion is altered, it directly influences functional capabilities by changing the muscle's line of action.<sup>30</sup>

Some authors have concluded that a woman is at a predisposition to separation if she is over weight, has a large baby, excess fluid in uterus,<sup>14(p90)</sup> or already has weakened abdominal structures prior to pregnancy.<sup>22</sup> Other factors that may determine the degree of diastasis recti include: weight gain during pregnancy, age, previous pregnancies, connective tissue insufficiency, and level of exercise of the mother.<sup>31</sup>

Anterior weakness, related to diastasis recti, can also lead to problems such as low back pain. Abdominal weakness in the expectant mother leads to incorrect posture and biomechanics, resulting in muscle strain of posterior structures that are forced to compensate.<sup>14(p29)</sup>

#### *Testing for Diastasis Recti*

Checking for diastasis recti should always precede any abdominal exercises during and following pregnancy.<sup>12</sup> The woman is in a hook-lying position. (Figure 5) Client slowly raises head and shoulders, reaching her hands toward her knees, until the spine of the scapula leaves the floor.<sup>7(p267),14(p90)</sup> Place the fingers on one hand horizontally across the midline of the abdomen at the umbilicus. If separation exists, the fingers will sink into the gap. Diastasis is measured by the number of fingers that can be placed between the rectus muscle bellies. A separation should be tested two inches above, two inches below, and at the level of umbilicus.<sup>7(p267),12</sup>

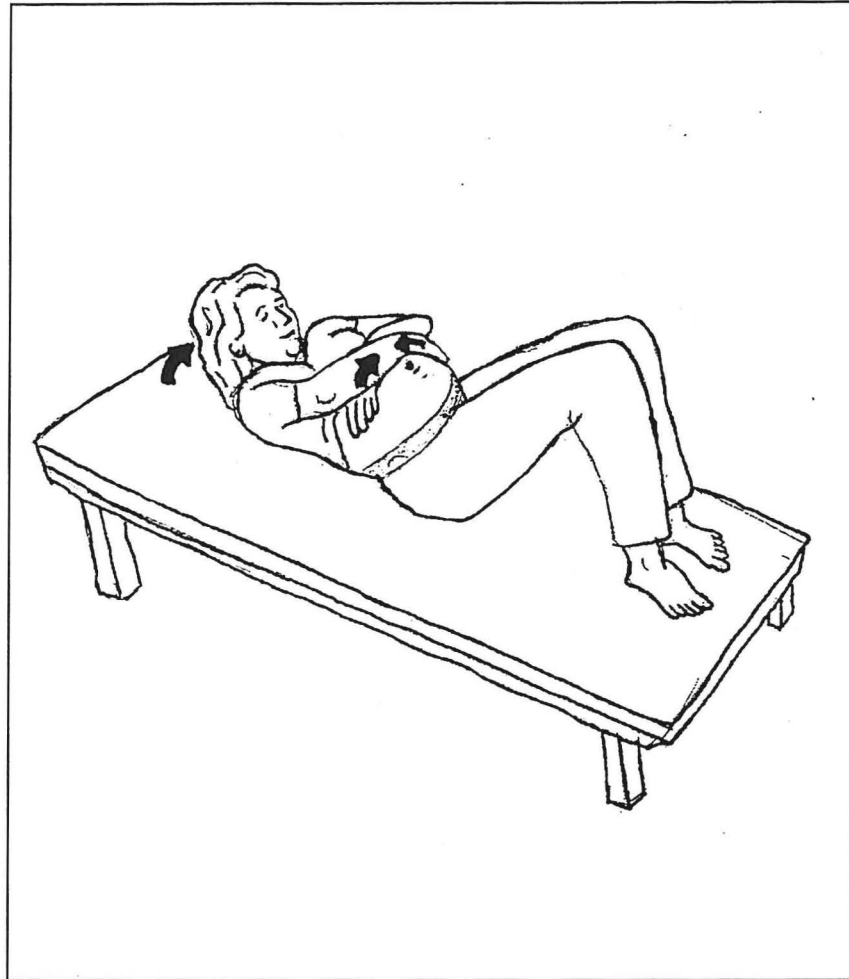


**Figure 5. Checking for diastasis recti.**

### *Corrective Exercises*

If a gap of more than more than two<sup>7</sup> or three<sup>14</sup> finger-widths exists, abdominal exercises must be modified in order to correct the separation. (Figure 6) It is suggested that abdominal exercises, including co-contraction of the pelvic floor, begin within the first 24 hours after delivery to restore tone.<sup>7(p267),14(p88)</sup> Initially, isometric abdominal exercises should be performed, with muscle contraction occurring during exhalation.<sup>32</sup> It is recommended to perform every hour and eventually progress to abdominal stabilization in all functional positions. Once the pelvis is stable and controlled movement is achieved, the level of difficulty can be increased by increasing repetition, adding limb loading, or performing the exercises during various activities such as sitting, lifting, and loading the car. Trunk rotational exercises should be avoided until there is no

separation.<sup>7(p227)</sup> Also, positions to avoid during separation include jack-knife and double leg lifts, as they may cause an increase in separation or injury to the low back.



**Figure 6. Corrective technique for diastasis recti.**

Changes that occur during the childbearing year introduce several areas of concern associated with pregnancy, in which some are more obvious than others. Abdominal injury would appear to be the most obvious injury resulting from pregnancy, yet many women fail to address its proper rehab. Whether from lack of knowledge or incorrect techniques, physical therapists can assist women to achieve a full recovery of the abdominal structure, which would in turn prevent future secondary complications and permit function essential during daily activities.

## CHAPTER IV

### POSTURE

#### **Importance**

Posture issues are observed and addressed by physical therapists everyday, and the pregnant population must be addressed as well. Correct posture is vital in day-to-day activities and can be defined as balance between the muscular and skeletal structures protecting the body against injury or progressive deformity.<sup>33</sup> Correct posture enables prolonged positions that are effortless, non-fatiguing and painless.<sup>34</sup> Typically, good posture consists of the plumb line passing through a person's earlobe, acromion process of the shoulder, slightly posterior to the hip, and slightly anterior to the knee and ankle joints. When correct body alignment is achieved, adequate support is provided avoiding unnecessary tension and stress. Thus, the body becomes more efficient and is able to function with minimal effort and fatigue in all resting and working positions.<sup>14(p107)</sup>

#### **Influence of Pregnancy**

During pregnancy, many adaptations are accomplished in response to the growing fetus that affects various aspects of a woman's body, including her posture. There are two main reasons posture is affected during pregnancy: anatomical change altering center of gravity, and hormonal influence affecting the stability of joint structures.<sup>14(p27),35</sup>

During pregnancy, a mother experiences an increase in weight of approximately 13.7-14.3 pounds (6200-6500 grams)<sup>36</sup> of extra weight all distributed in the anterior portion of her body. This change in weight distribution causes an anterior and superior

shift in center of gravity.<sup>12</sup> In order to maintain balance and stability, postural compensation must occur by a shift in body weight toward the heels. This brings the center of gravity more posterior to accommodate for the anterior weight increase.<sup>12,35,37,38</sup> This posterior position reduces a mother's stability that is often accommodated for by walking with a wider base of support resulting in a 'waddling gait'.<sup>37</sup> If a posterior shift to compensate for the added anterior weight does not occur, faulty posture may result, predisposing the mother to fatigue, pain, and dysfunction.<sup>25</sup>

Hormonal changes that occur during pregnancy can also have an effect on a woman's posture. Ligaments provide a major supportive role during standing, which is compromised during pregnancy due to increased hormone levels such as relaxin, progesterone, estrogen and cortisol, and results in generalized joint laxity.<sup>39</sup> An increase in the level of hormones during pregnancy, as stated by Moore,<sup>40</sup> results in less supportive connective tissue and also contributes to the loosening of the abdominal fascia. This loosening may result in a decreased ability to stabilize the pelvis possibly leading to muscle imbalances, inefficient movement, changes in posture and the development of low back pain.<sup>41</sup> Therefore, during pregnancy, it is imperative that the supporting muscles share the increased stress in order to take the load off the softened ligaments.

As a result of hormonal effects and anatomical changes, the mother is susceptible to developing weakness from muscles remaining in lengthened positions over extended time periods. During pregnancy, stretch weakness commonly results in anterior neck, upper back, and lower abdominal regions.<sup>7(p176),25</sup> Increasing weight of the breasts tend to put an increased load on the mid thoracic region. If muscles involved are unable to



maintain good postural alignment, a stretch weakness of the posterior structures may occur, resulting in scapular protraction and rounded shoulders.<sup>7(p176),12</sup> If this posture is maintained for a period of time, it will result in shortened anterior structures. Poor postural habits tend to create a chain of events occurring in other regions, which further complicates postural issues. For example, a person with faulty posture of forward or “rounded” shoulders, is more likely to have increased cervical lordosis and also develop a faulty forward head to compensate.

The abdominal muscles are also at an increased risk for stretch weakness. The pelvis tends to angle forward during pregnancy due to increased abdominal weight and stretching of the abdominal wall, in order to accommodate the growing fetus. Persistence of this anterior pelvic tilt causes abdominal muscles to weaken, and the opposing back muscles will have to compensate by working harder.

Although it is certain pregnancy causes postural changes, there is much controversy on the exact nature of the exaggerated lumbar lordosis associated with pregnancy. Some authors feel the increased lumbar lordosis results from the shift in center of gravity and the constant contraction that back muscles must exert to compensate for abdominal weakness.<sup>7(p176),14(p109)</sup> Others<sup>25</sup> feel it may be an actual increase in the lumbosacral angle resulting from the anterior pelvic tilt, combined with the posterior shift of the trunk. These discrepancies may be a result of different measurement techniques, time of assessment during pregnancy, differences in initial posture type due to ethnic background as well as initial postures of women tested prior to pregnancy.

No matter where or what postural changes occur during pregnancy, if poor posture habits result, a woman is at risk for increased aches and possible injury. If a

woman has posture problems prior to pregnancy, the stresses of pregnancy may magnify her chance of injury during her childbearing year. Pregnant or not, correct posture requires muscles that are strong, flexible, and easily adaptable to environmental change.

### **Postpartum**

It is a logical conclusion that once the baby is born, a woman's posture returns to her prepartum state. In fact, even though posture is compensated as a result of anterior weight gain and hormonal increases during pregnancy, changes in posture do not usually correct spontaneously after childbirth. Bullock-Saxton et al,<sup>42</sup> and Dumas et al<sup>43</sup> researched posture following pregnancy and found postpartum posture was not significantly different from that measured in the late stages of pregnancy and exaggerated postures were even sustained three months postpartum. Another study states even though relaxin levels return to normal within 3-7 days postpartum, the functional effects may persist for up to 12 weeks.<sup>44</sup> Furthermore, postural changes and muscle weakness, as a result of pregnancy, may persist for up to 12 months postpartum.<sup>21</sup> It can then be concluded that pregnant posture may be maintained as a learned posture, and without intervention, may persist beyond the childbearing year. These inefficient compensations may amplify the stresses of daily activities as well as new tasks required to care for the infant, and may lead to pain, dysfunction and increased fatigue.<sup>25</sup>

### **Low Back Pain**

Faulty posture commonly is not noticed until symptoms of pain or deformity become present, which may take years to develop. During pregnancy, however, these symptoms become apparent at a faster rate, due to the increased stresses the body endures.<sup>14(p28)</sup> Low back pain (LBP) is a common complaint during pregnancy, with

studies finding incident levels ranging anywhere from 48% to as high as 70%.<sup>39</sup> A variety of studies have listed a multitude of possible factors resulting in pain during pregnancy. Low back pain factors<sup>45</sup> include: weight gain during pregnancy, rapid postural changes, vascular effects, previous back pain experienced during menstruation, back pain in previous pregnancies, and repetitive lifting/bending.

It is clear that low back pain is very prevalent during pregnancy, but it is also a very common complaint persisting after delivery. Ostgaard and Andersson<sup>46</sup> performed a large study on postpartum back pain and discovered 67% of women experienced low back pain at the time of delivery, and 37% were still experiencing some back pain 18 months after delivery, with 7% experiencing serious back pain. With back pain being very prevalent throughout the childbearing year, it is essential that early measures be taken to avoid the possibility of back pain becoming a chronic condition.

The causes and treatment of low back pain have been researched over the years and continues in exploration of solving this worldwide problem. A study by Gillear<sup>41</sup> found low back pain, in relation to pregnancy, could result from inadequate functioning abdominal muscles. He states weakened abdominal muscles may also result in the inability to stabilize the pelvis, muscle imbalances, inefficient movement, and changes in posture. Further studies investigating low back pain agree that inadequate muscle support of the spine leads to low back pain.<sup>47-50</sup> These studies target a lack of proper activation from the transversus abdominis and multifidus muscles. They also advocate exercise programs designed for low back pain clientele. Treatment strategies including specific, controlled activation of these two stabilizing muscles instead of traditional activation of rectus abdominis and oblique muscles. It is relevant to consider this

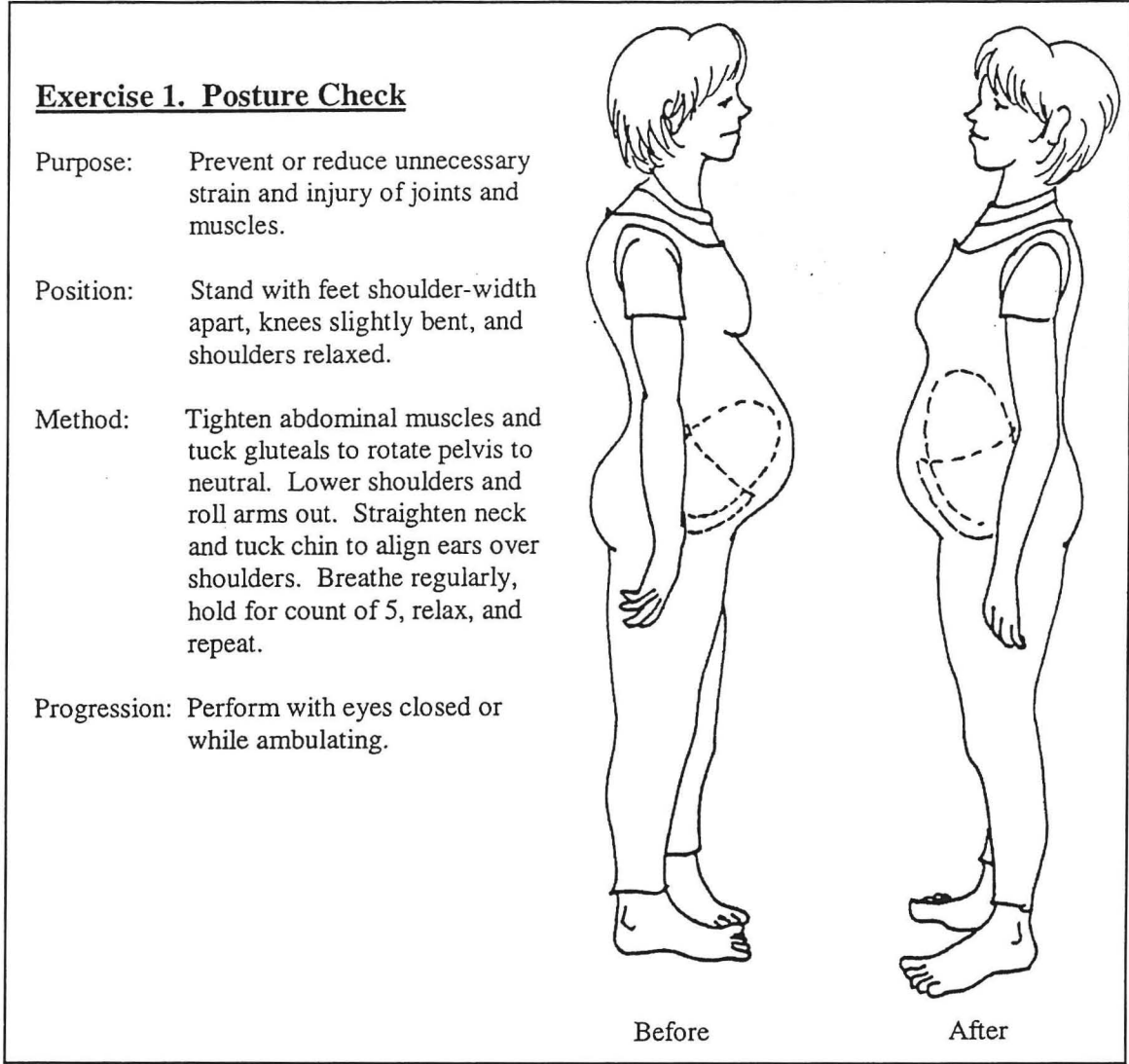
information and apply it to the pregnant population, due to the high occurrence of low back pain throughout this period. Research must continue on low back pain populations, pregnant or not, in attempt to minimize the alarmingly high statistics associated with back dysfunctions throughout the world.

### **Exercises to Improve Posture and Pain**

It is important to remember that despite numerous changes occurring due to pregnancy, the childbearing state certainly does not mean that a woman must suffer poor posture. New demands and positions are required in caring for the infant, and may add to the already stressed postural muscles. Therefore, exercises and reeducation can be of great value and are essential in the prevention of potential problems.

The first step in avoiding problems from poor posture is to educate women on correct posture alignment. A woman can be educated on her alignment by using a mirror during standing and sitting activities, and four-point kneeling. Refer to the posture checklist provided for common areas of concerns during pregnancy. (See Figure 7)

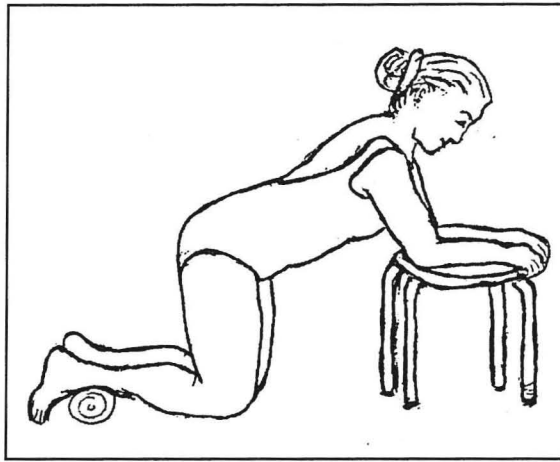
Gaining control of the spine is often easiest to initiate in four-point kneeling positions, which is also a position of comfort during the progression of pregnancy.<sup>21,25</sup> This is an excellent position to utilize during pregnancy because a woman is able to achieve a neutral pelvis, and also neutral lumbar, thoracic, and cervical positions. This neutral position requires a co-contraction of the shoulders and trunk, including the transversus abdominis and multifidus muscles.



**Figure 7. Posture Check. Reprinted with permission by S Ripplinger.**

In attempt to strengthen specifically the transversus abdominis and multifidus in four-point kneeling, the abdominal wall should contract slowly towards the spine.<sup>25</sup> No movement of the spine or depression of the rib cage should occur during this activity and contraction should be held for up to 10 seconds. Co-contraction of the pelvic floor muscles can also assist in achieving the contraction of the transversus abdominis and multifidus.<sup>50</sup> Other progression may involve reaching activities in sitting and standing, while maintaining neutral alignment; decreasing base of support; and introducing unstable surfaces. Modified four point kneeling position should be used postpartum until

the vaginal and uterine wall have healed (approximately 6 weeks postpartum) to avoid possibility of air embolus.<sup>25</sup> (Figure 8)



**Figure 8. Postpartum Modified Four-Point Kneeling**

Activation of the transversus abdominis can also be achieved while lying on the back or side with knees bent.<sup>14(p95)</sup> During this exercise, a complete breath is taken in through the nose, allowing the abdominal wall to expand upward. The air is exhaled out through pursed lips of the mouth, slowly but forcibly, pulling in the abdominal muscles until out of air. It is important to rest between efforts to avoid dizziness. Progression includes performing this exercise while sitting in a rocking chair. Exhaling, along with contraction of the abdominals, should take place while rocking back.

Avoiding unnecessary tension and stress, while maximizing efficiency and endurance is important during pregnancy and can be achieved through correct postural alignment and stability. In order to achieve this, a proper posture evaluation must be done by an appropriate healthcare provider in attempt to pinpoint what structures need to be addressed and then appropriate exercises prescribed.

## CHAPTER V

### SCAR TISSUE

#### Episiotomy

In attempt to ease vaginal delivery and minimize damage, an episiotomy (an incision cut to enlarge the outlet)<sup>14(p66)</sup> may be performed.<sup>9</sup> An episiotomy procedure has been described as “the most common operative procedure during delivery.”<sup>8(p270),34</sup> Supporters of this procedure conclude that it accelerates the birth process; assists the delivery of premature, distressed and breech babies; avoids excessive stretching or tearing of surrounding tissues,<sup>32</sup> and reduces compression of the baby’s head.<sup>14(p66)</sup>

There is much controversy in the literature as to whether episiotomies help or hinder the birthing process and recovery. One study<sup>51</sup> suggests there is a reduction in pelvic floor injury when utilizing episiotomy procedures, yet another study<sup>52</sup> states performing episiotomy procedures increase the likelihood of major perineal trauma. With the exception of fetal distress, many researchers think episiotomies are over-utilized often in fear of the potential tearing that may occur. Other studies<sup>53</sup> suggest there is little support for the claim episiotomy prevents tears in normal deliveries, and routine episiotomy procedure performed during childbirth may only further tear the perineum according to Elizabeth Noble.<sup>14(p66-67)</sup> She states that once the perineum is cut, the mother is at risk for further tearing during delivery, resulting in greater damage than if tissues had torn naturally. She goes on to state that an intact perineum proves beneficial by squeezing the baby’s chest to help to expel mucus from its lung, which reduces the need

for suctioning after birth. With these contrasting viewpoints on the role of episiotomy during childbirth, more research is needed to clarify the benefits and risks involved.

### *Incisions and Degree of Tears*

There are different classifications of episiotomy incisions, and also different degrees of episiotomy tears. Episiotomy incisions include medial, mediolateral and J shaped.<sup>32</sup> Noble states that a midline/medial incision is easier to repair and heal, but is commonly not used for fear of further tearing into the anal sphincter.<sup>14(p66)</sup> For this reason, it is preferred to cut to one side at the expense of greater blood loss, more postpartum discomfort, and increased difficulty regaining muscle function.

Perineal lacerations are divided into four degrees. A tear of the skin and vaginal mucus membrane of the perineum is considered a first-degree tear, whereas a second degree further tears into the underlying muscles of the perineal body. According to the Gynecological Manual,<sup>8(p271)</sup> an episiotomy is defined as at least a second-degree laceration. Third degree laceration progresses to involve the anal sphincter, while fourth degree tears extend into the anal sphincter and through the rectal mucosa to expose the lumen of the rectum.

### *Associated Problems*

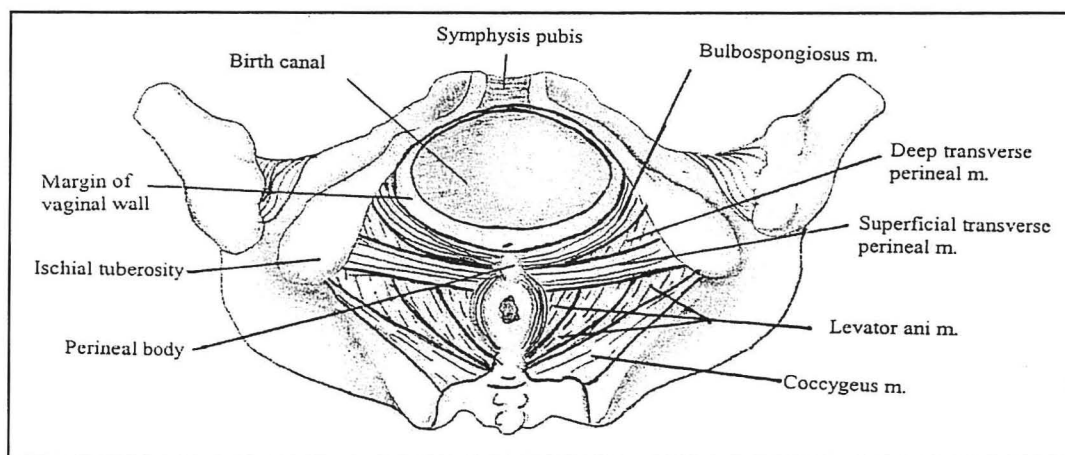
Episiotomy procedures involve incising the pelvic floor musculature therefore affecting their functional role. The effects of damage to the pelvic floor are addressed in the pelvic floor section and the reader is referred this section for more detail. In addition to incisional damage, a woman may also experience problems as a result of the newly developing connective tissue. Healing scar tissues develop hypersensitive adhesions and trigger points that may cause pain during intercourse called dyspareunia. A six-year



study<sup>54</sup> of over 450 women suggested painful intercourse was a significant problem prevalent in 30% of women who had episiotomy procedures during childbirth. Six months following delivery, these women still reported mild dyspareunia, which was not present in the sample of women who tore naturally.

### *Prevention*

When looking at the alarming numbers of problems resulting from episiotomy procedures, preventative measures available to minimize excessive tearing or episiotomy procedures must be utilized. Perineal stretching is a technique done by the expectant mother in the last six weeks before delivery, which can possibly prevent excessive tearing and/or the need for an episiotomy. The purpose of perineal stretching is to prepare the vaginal tissues for the enormous stretch that must occur during delivery. Pelvic floor exercises are essential in the prevention of tearing by improving the woman's awareness of relaxation of these muscles. This relaxation is vital during delivery because it allows the fetus to pass through the birth canal easier. (Figure 9) A further explanation of these prevention techniques are provided in Appendix B.



**Figure 9. Birth Canal and Stretching of Pelvic Floor Structures.**

Adapted from Snell, R. Atlas of Clinical Anatomy, 1978:148.

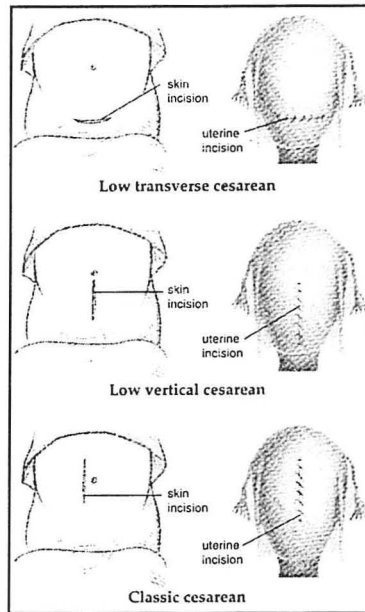
A Quebec study by Labrecque et al<sup>55</sup> examined the effect of perineal massage performed by mothers prior to delivery. A significant increase in a woman's chance to preserve an intact perineum was reported by performing perineal massage prior to delivery, if it was her first vaginal delivery. However, no significance was found for those women performing perineal massage if they had a previous vaginal delivery.

Other ways to avoid possible tearing and episiotomies during delivery can be achieved positionally. A rapid advancing second stage of labor can be less strenuous if the mother is positioned sidelying to eliminate gravity. The squatting position may assist in slow advancing second stage labor by using gravitational forces along with further opening of the pelvic outlet. Gravity assisted delivery helps limit tearing to the superficial labia, avoiding deeper tissue tears and the need for an episiotomy.<sup>14(p67)</sup>

### **Cesarean Delivery**

It is reported that one out of every four births result in the surgical procedure Cesarean section.<sup>7(p261)</sup> Cesarean birth (AKA C-section) is defined as the delivery of the fetus through a surgical incision in the wall of the uterus and abdomen instead of the vagina.<sup>14(p193),32</sup> The incision may be a low transverse, low vertical, or classic cesarean;<sup>56</sup> with a report of 90% of all procedures in the United States being low transverse.<sup>57</sup> (Figure 10) Between 1960 and 1965, it was reported that 5% of all deliveries were C-sections.<sup>58,59</sup> In 1995, the C-section rate jumped to 21% overall.<sup>60</sup> C-sections have become increasingly more common mainly for safety reasons of mother and baby. Some other reasons for choosing cesarean over vaginal birth include: previous C-sections, size of the fetus is thought to be too large for the mother's pelvis, a disease risking the mother

or baby's wellness, the placenta blocking pelvic exit, fetal distress, failure of uterus to progress fetus through birth canal, and breech positions.



**Figure 10. Cesarean Incisions.** Reprinted with permission of Childbirth Graphics.<sup>56</sup>

#### *Associated Problems*

Besides pregnancy issues, a woman undergoing a C-section delivery will have the additional concerns associated with major abdominal surgery. C-section delivery differs slightly from a vaginal delivery, in that there is an abdominal incision that needs to be addressed instead of a vaginal one. Even though a woman will not experience damage to the pelvic floor as a result of an episiotomy, a woman experiences the same changes that occur as a result of pregnancy in the uterus, pelvic floor, and urinary and gastrointestinal tracts.<sup>7(p271)</sup> Also, it must be considered that a mother may have experienced a lengthy labor and trial pushing prior to the surgical procedure and may acquire additional complications. Complications resulting from the surgical procedure, possible second stage of labor, or from pregnancy itself include:<sup>12</sup> respiratory problems with an increased risk of pneumonia, post-surgical pain and discomfort, risk of vascular complications

(including edema, deep vein thrombosis[DVT], and pulmonary embolus [PE]), development of adhesions at incisional site, faulty posture possibly leading to back pain, pelvic floor dysfunction, and abdominal weakness.

Many women are under the misconception that once a cesarean delivery is performed, every delivery after that must also be cesarean. This is not necessarily true. According to Goldman et al,<sup>61</sup> the chance to deliver vaginally after a C-section are high if her doctor has a 20% or less C-section rate out of all deliveries, is younger than 54, and have less than 5% risk population. If the phrase “once a C-section always a C-section” is bothersome for women, according to this study, it is vital to statistically research possible physicians and their practice before choosing.

#### *Recovery*

Vaginal and cesarean deliveries require essentially the same rehabilitation, with the exception of a C-section constituting a major surgical procedure. Therefore, a C-section entails all the risks and complications of abdominal surgery, and in addition to the vaginal delivery concerns (excluding episiotomy), will require a general surgical rehabilitation and a longer recovery.

It is recommended that the mother begin ambulation within the first 12-18 hours after delivery to increase intestinal motility, decrease muscle stiffness, and prevent postoperative complications such as DVT and PE.<sup>7(p272)</sup> A recovery program should be implemented within the first 24 hours and reinforced every two hours by appropriate personnel. After a surgical procedure such as this, pooling of mucus in the lungs may occur from anesthetic use. Therefore, it is essential that breathing exercises, such as huffing, be implemented as soon as possible in the recovery process.<sup>7(p272),14(p99),32</sup> In

addition to breathing activities, appropriate abdominal, pelvic floor, posture, and scar massage exercises should be initiated. The recovering woman should be educated on guidelines of proper adaptations to daily activities, and also prescribed additional exercises including: active/active-assisted range of motion,<sup>32</sup> hooklying knee rolls from side to side, heel slides, ankle pumps, bridging, pelvic rocking,<sup>14(p200)</sup> abdominal contraction on expiration,<sup>32</sup> and isometric gluteal contractions. It is vital that women experiencing C-section procedures understand that activity stimulates healing by increasing circulation and the key to a successful rehabilitation is exercise.<sup>7(p272,277)</sup> See Appendix C for a Post-Cesarean Exercise Program / Body Mechanics Guidelines for Post-Cesarean Patients.<sup>7(p279)</sup>

### **Scar Massage / Mobilization**

Whether a C-section or episiotomy, the resulting scar tissue needs attention in order to minimize potential problems. Stress from trauma, as seen in an episiotomy or C-section, result in tissue shortening and the fascia binds down.<sup>62</sup> Abnormal pressure is placed on surrounding organs, nerves and blood vessels, which may result in pain, pulling, altered sensation and/or poor function of organs and muscles. Scar massage/mobilization to the episiotomy or C-section incision site is a vital component in treatment and preventing subsequent problems from this abnormal pressure and is effective and easy to perform.

Following an episiotomy, perineal scar massage may be performed by a Physical Therapist, a second party, or by the woman herself.<sup>8(p273)</sup> To start, make sure the postpartum woman is in a comfortable, hooklying position. Use the pressure of the index finger at one end of the scar line and feel for tender points or adhesions, which are hard

and painful palpable spots. Without sliding on the skin, move back and forth slowly, superficial tissue on deeper tissue, over the tender point on the scar line. Sustaining deep pressure to the tender points can also loosen scar tissue effectively. The soft tissue of the vagina, rectum and levator ani muscles may require attention if deeper lacerations occurred during delivery. Refer to Appendix D for further detail and illustrations.

The time spent performing scar massage varies depending on tolerance. Scars may be so sensitive that it may be necessary to begin by rubbing area with a soft cloth for short periods. When tolerated, it is recommended to spend one to three minutes at each tender point throughout the line of the scar, with a total treatment time requiring up to 20 minutes. Massages should be repeated on a daily basis. Perineal massage prior to intercourse may benefit to decrease dyspareunia.

Initial treatments may be painful with limited tolerance that may be improved by using heat or ultrasound prior to perineal massage. Heat modalities may also be used prior to abdominal massage, but controversy exists on the use of ultrasound to this region. Some authors state ultrasound is appropriate in the abdominal region, just not over the ovaries,<sup>8(p278)</sup> while other authors state absolutely not. This is an area of concern that needs further research. An alternative to this controversial concern is to perform abdominal scar massage in a warm bath or after a warm shower.

Scar massage to the abdomen after a C-section varies slightly from that performed in the perineal region. There are four different techniques utilized in the abdominal region including desensitization, push and pull, skin rolling, and plucking.<sup>8(p280)</sup> With these techniques, it is beneficial to work as firmly as possible while remaining just under pain tolerance. It is very important to start gently, and progress slowly to deeper tissues.

Sharp stabbing pain should never be felt but a strong pulling or light burning sensation is permitted. As in the perineal massage, up to 20 minutes daily is recommended. Refer to Appendix E and F for further details and illustrations.

Scars resulting from pregnancy have the potential to affect many areas of the body and play a major role in pelvic dysfunction evident throughout the childbearing population. Addressing scars appropriately are essential in assuring a complete recovery from the childbearing year and ultimately minimize possible problems that may become evident in the future.

## CHAPTER VI

### CARDIOVASCULAR EXERCISE

#### **Fetal Response to Exercise**

Lack of adequate knowledge, combined with unclear information on appropriate and safe forms of exercise, contribute to the reluctant behavior towards exercising during pregnancy. Furthermore, many women are misinformed and led to believe various misconceptions once thought to be true regarding the harmful effects of exercise during pregnancy. Human research has yet to provide conclusive evidence proving harmful fetal response to exercise of mild or moderate intensity.<sup>12</sup> Even vigorous exercise studies concluded negative results less than as once thought, resulting in more liberal restrictions during pregnancy.<sup>63,64</sup> Further studies have not been able to report any consistent differences between those who exercise and those who do not concerning rate of spontaneous abortion, pre-term labor, fetal distress or birth abnormalities, and ability to carry to term.<sup>65</sup> Common areas concerning fetal effects during maternal exercise discussed in this section include: hyperthermia, abnormal heart rate changes and hypoxia, changes in uteroplacental blood flow, and decreased fetal weight.

#### *Hyperthermia*

Exposing the fetus to hyperthermic conditions as a result of intense exercise has been studied throughout the pregnant population.<sup>21</sup> There is a lack of human research suggesting pregnant women, who are regular exercisers, reach a level of exertion to



cause significant fetal hyperthermia.<sup>65</sup> Thermoregulation is thought to become an issue when sedentary women attempt to perform activities at strenuous levels.<sup>21</sup> Regardless, it is recommended that pregnant women avoid core temperature increases to 38.9° C (102° F),<sup>66</sup> which has been achieved in non-pregnant women exercising strenuously for longer than 30-60 minutes.<sup>44</sup> Another study<sup>68</sup> compared women exercising on land and those exercising in water in relation to core temperature increases during pregnancy. The author of this study, in agreement with others,<sup>64,67</sup> concluded that heat stress is not a major issue in normal fit pregnant women who participate in moderate exercise regimens.<sup>68</sup>

#### *Increased Heart Rate*

Studies suggesting harmful increase in fetal heart rate during exercise is another reason women are reluctant to participate in exercise activities during pregnancy. Occurrence of increased fetal heart rate during and after maternal exercise has been found in numerous studies,<sup>69-71</sup> one of which related the increase to gestational age and duration, intensity and type of exercise.<sup>69</sup> Initially, the fetal heart rate will usually increase 10 to 30 beats per minute and during moderate exercise periods, return to normal within 15 minutes. Fetal bradycardia, followed by brief periods of tachycardia, has been reported as a result of maternal exercise.<sup>70,71</sup> This may be related to brief periods of hypoxia experienced by the fetus,<sup>70,72</sup> although no harmful effects have been noted in a healthy fetus as a result.<sup>72</sup>

#### *Reduction in Blood Flow*

A major body response when exercising is an increase in blood flow to the working muscles, which compromises blood flow to the splanchnic organs. This

response has led to various theories and concerns, one being the impact exercise has on blood flow to the fetus during pregnancy.<sup>73</sup> Research has shown that fetal blood flow through the main uterine artery may decrease during intense exercise, however, studies indicate that at least 50% reduction is necessary before fetal harm results.<sup>74</sup> Authors suggest that no studies have shown that these extreme blood flow reductions occur in pregnancy during exercise, even at higher intensities.<sup>63,64</sup> Several authors suggest the reason for this absence of decreased uterine blood flow during exercise may be contributed to the body's increased cardiac output present during pregnancy.<sup>75</sup>

### *Decreased Weight*

The literature on fetal weight loss due to exercise is not conclusive. Various authors<sup>12,63,64,72,75</sup> claim a continued endurance exercise regimen into the third trimester experience a slight decrease in fetal weight upon delivery. However, Rose et al<sup>77</sup> found no significant difference between exercisers and non-exercisers and low birth weights, although validity may be questioned due to a self-rating of physical activity by the expectant mothers. Although some studies suggest exercise leads to lower fetal weight upon delivery, authors state these deliveries are well within the normal limits and the slight decrease is partly due to less fetal body fat.<sup>63</sup>

### **Maternal Benefits**

Pregnancy itself causes increased demands on the body to accommodate for the continual development of the fetus. Due to misconceptions once thought true, women often think the benefits of exercise during pregnancy are not worth the potential harm placed on the fetus. Some women fear exercising will create an overload in the demands

placed on the body, resulting in inadequate amounts of essential nutrients and supplies necessary to ensure healthy growth and development.

Recent studies indicate that moderate fitness conditioning can increase metabolic and cardiopulmonary capacities without negatively impacting fetal development or pregnancy outcome.<sup>78</sup> The list of benefits regular exercise has on a body is extensive and has resulted in a worldwide trend to participate. Some of the same benefits are experienced when women exercise during pregnancy, but unfortunately, women are reluctant to exercise for various reasons.

### *Exercise and Delivery*

Even though exercise is an important component to being healthy during pregnancy, it is important to realize that regular exercise during pregnancy will not guarantee an easy delivery with no complications. Studies do indicate however, that there are positive effects of regular exercise on the outcome of labor and delivery. One study<sup>79</sup> tested the hypothesis that running and aerobics during the second half of pregnancy created negative and undesirable outcomes during the course of labor and delivery. It was found the exercise group experienced an overall lower occurrence of operative abdominal and vaginal delivery, overall shorter labor duration, and decreased signs of fetal distress. Botkin and Driscoll<sup>80</sup> noted similar findings in that the exercise group showed significant decrease in the duration of second stage labor and fewer complications.

### **Prepartum Exercise**

Perhaps the most popular area of interest among pregnant women concerning exercise and pregnancy include: the type of exercise that can be participated in, and how

hard and how often that type of activity can be performed. Women are often confused on the recommendations concerning exercise guidelines. This confusion is mainly due to the difficulty of providing generalized guidelines for all women during pregnancy when there exists vastly different exercise levels between women. In the past, a conservative approach to guidelines has been taken for fear of women overexerting themselves and causing potential harm to the fetus. These conservative guidelines, however, were considered too strict for those aerobically fit women involved in a regular moderate exercise regime prior to pregnancy. One article<sup>81</sup> studied women who exercised prior to pregnancy and continued to exercise during pregnancy, at levels exceeding the recommended guidelines from the American College of Obstetricians and Gynecologists (ACOG). The study found there were no adverse affects in pregnancy outcomes, and also discovered a lower cesarean rate present among women exercising above recommended guidelines, but not in women following conservative guidelines. Refer to Appendix G for specific exercise guidelines during pregnancy.

Over the years, a more liberal approach has been taken in regards to exercise guidelines during pregnancy. Some authors argue that this increased leniency creates an increased responsibility for both the pregnant woman and her doctor, which generates the need for a good communication base between the two. It is therefore, essential that the appropriate health care professionals provide adequate information on exercise during pregnancy and individualize exercise guidelines to suit each woman, based on her prior activity level.

## CHAPTER VII

### METHODOLOGY

#### **Subjects**

Postpartum women over 18 years old, who received postnatal care in the Grand Forks or Devils Lake communities could volunteer to participate in this project. The women must have given birth within six months of filling out the survey to be included. The patient's consent was assumed if the survey was completed and returned.

#### **Instrumentation**

A two-page survey and cover letter was given to the participants (Appendix H). The survey requested information in both a quantitative and qualitative format. Data included information on services/information acquired during and after pregnancy.

An explanation of the benefits, criteria, guarantee of confidentiality, and a statement of voluntary participation to begin this survey was discussed in the cover letter. Patients were encouraged to speak to their doctors if concerns arose and were provided names of health care professionals in physical therapy if they wished to seek treatment.

University of North Dakota (UND) Physical Therapy students Christel Parvey and Tami Parker developed the questionnaire with the assistance of UND faculty, Associate Professor Bev Johnson and UND Instructor Cindy Flom-Meland. It was revised by three physical therapists actively working with women's health issues: Laurie Betting, Leatha

Vaagen, and Megan Boyd. Finally, it was supported by local prominent physicians in this field. The project was approved by the Institutional Review Board (IRB) for University of North Dakota and also the IRB for each participating facility. (Appendix I)

### **Procedure**

The survey was provided to the nurses of participating doctors who supported this project. It was handed out by the nurse or receptionist at a woman's six-week appointment following childbirth and filled out while the client waited. Women who have given birth within six months were also included in the survey secondary to patients not always attending their six-week checkup. A self addressed envelope was provided along with the survey; the patient then sealed the survey in the envelope and returned it to the nurse or receptionist to be stored in a secure file cabinet for confidentiality. The collection period extended from July 17 to October 20, 2000.

### **Data Analysis**

Descriptive statistics were used to assess the need for program development and assess awareness and compliance in women of childbearing years. We used the information that was being provided to these women and compared it to an ideal or optimal program based on a literature review.

### **Data Reporting**

Results of this survey are described in this Independent Study Report. The report is available at the University of North Dakota Harley French Medical Library. This information was also shared in aggregate with participating facilities and health care providers. Health care professionals can utilize this information to develop programs and address issues missed between professionals to better serve their patients.

## CHAPTER VIII

### RESULTS

Fifty-eight of the 64 surveys returned met the established criteria. The six not included either failed to meet the mother's age requirement ( $\geq 18$  years old), could not determine whether childbirth was within a six month time frame, was not received by the deadline, or was not from the selected facilities.

#### **General Demographics**

The age of mothers responding to the survey ranged from 18 to 41 years with an average age of 27.8 (SD= $\pm 4.9$ ). The surveys were handed out at the following Grand Forks, North Dakota facilities: Altru Family Medicine, Altru Main Clinic, and UND Family Practice; the other studied facility was located at the Lake Region Clinic in Devils Lake, North Dakota. The majority of respondents (78%) received care in Grand Forks, and 40% of women were first time mothers. The majority of women experienced a vaginal delivery (93%) with 43% occurrence of episiotomy. Only 15% reported a C-section with any delivery. Refer to Table 1 for an inclusive subject profile.

#### **Problems**

A list of six common problems in pregnancy was addressed with a yes/no option. The data was divided and analyzed by women experiencing vaginal, episiotomy or cesarean section during delivery. A comparison was made between the number of problems seen and the percentage of women experiencing them. Data was spread

between all categories with women experiencing anywhere from zero to six total problems for vaginal deliveries, with an average of 2.16 problems per woman. Women with episiotomies reported an occurrence of zero to five problems with an average number of problems being 2.17 per woman. Finally, out of the eight respondents who had a C-section, five women reported experiencing two problems.

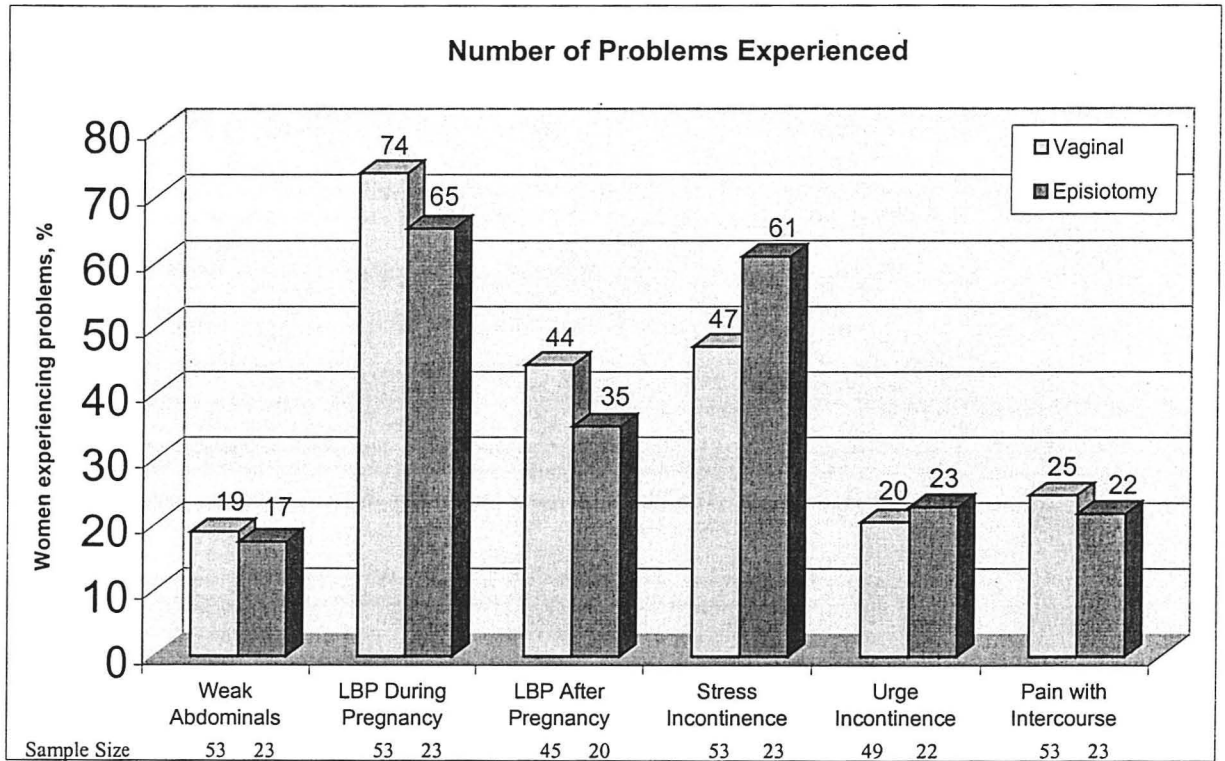
**Table 1. General Demographics**

	<u>N</u>	<u>%</u>
Where did you receive your prenatal/postnatal care?		
Altru Family Medicine Center, Grand Forks, ND	8/59	13.5
Altru Main Clinic OBGYN, Grand Forks, ND	21/59	35.5
UND Family Practice, Grand Forks, ND	17/59	29
Lake Region Clinic, Devils Lake	13/59	22
Number of full term pregnancies		
One	23	40
Two	22	37
Three	12	21
Four	0	0
Five	1	2
Number of women who had vaginal deliveries	54/58	93
Number of women who had an episiotomy	23/54	43
Number of women who had a C-Section	8/53	15
Women who walked during pregnancy 3+ times/week	25/45	56
Women who walked after pregnancy 3+ times/week	22/39	56

An analysis of women experiencing each problem individually was also compared between vaginal, episiotomy, and C-section. Low back pain (LBP) during pregnancy was the predominant problem seen in all three categories. Even though the C-section sample size was too small to draw any significant conclusions, it is interesting that all



eight women experienced LBP during pregnancy. The second most common problem, stress urinary incontinence, was seen in 47% of women with vaginal deliveries and 61% following an episiotomy (Figure 11).



**Figure 11. Common problems with pregnancy.**

Women who sought treatment for the problems seen in the childbearing year was exceedingly low. Three of thirteen women (23%) sought help for weak abdominals, while three of eleven (27%) sought help for pain with intercourse. Women seeking treatment for LBP included thirteen of 43 women (30%). Ten of these thirteen women sought treatment from a health care provider. Finally only one of the 23 (4.3%) women with incontinence sought treatment.

Of the ten women who sought treatment for LBP from health care providers, one sought chiropractor treatment, three went to the Physical Therapy (PT), and two

individuals received both PT and chiropractic care. The other women who sought treatment did not specify from where.

### Information

Women were asked if they received information on various pregnancy issues and also indicated who provided the information. Women were given seven choices and were able to select multiple resources (Figure 12). Books and medical doctors were utilized most often, being selected a total of 118 and 92 times, respectively. This was followed by sixty-two women who received information in a prenatal class. All other disciplines were selected #30 times. Exercise intensity was the most addressed issue (88 women received information) followed by pelvic floor exercises (69), physical changes (65) and breathing techniques (64). Refer to Table 2 for complete summary of data.

**Table 2. Number of women receiving information on various pregnancy issues**

	Source of Information							Total
	MD	NP	N	PT	ExC	PreC	Books	
Exercise Intensity	35	6	5	4	2	7	29	88
PF exercises (Kegel's)	15	3	5	4	2	11	29	69
Scar massage/mobility	9	2	4	3	1	6	11	36
Breathing techniques	8	3	5	2	0	27	19	64
Physical changes	18	4	7	4	1	11	20	65
Correct Lifting Techniques	7	1	4	2	0	2	10	26

### Exercise

Women also commented on physical activities performed before and after childbirth. Walking was the predominant activity occurring at a rate of 77.6% during

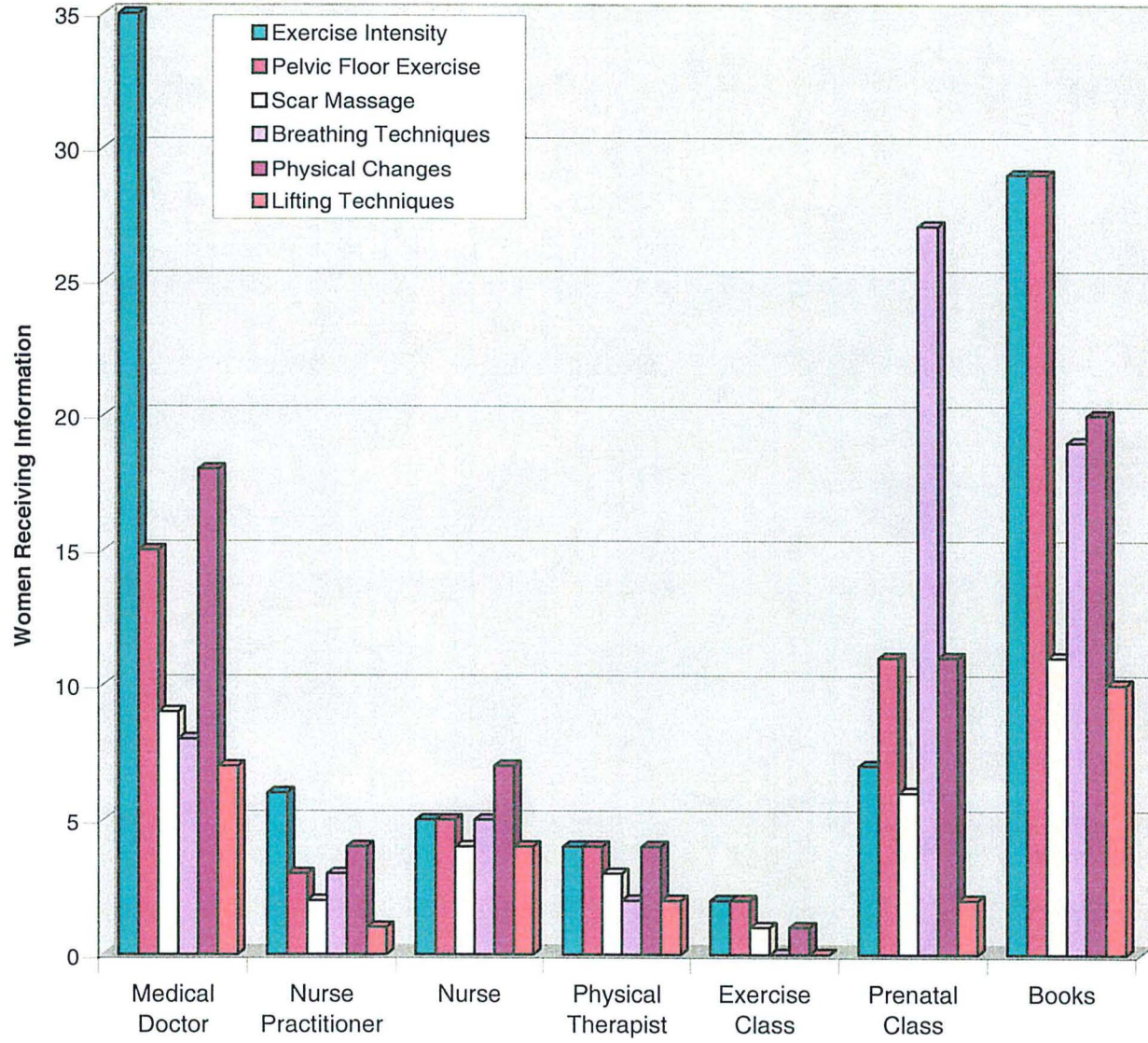
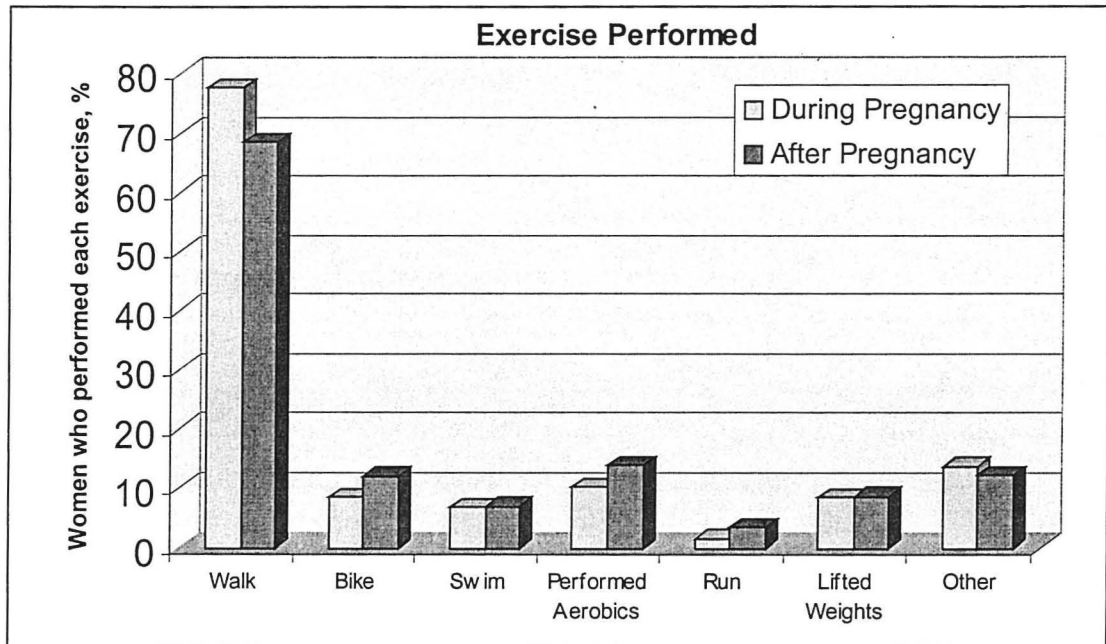


Figure 12. Sources of health information.

pregnancy and 68.4% following pregnancy. Biking, swimming, performing aerobics, running, lifting weights, or other activities were reported in less than 15% of women either during or after pregnancy (Figure 13).



**Figure 13. Exercise during and after pregnancy.**

Not all of these women exercised on a regular basis, defined by ACOG guidelines as three more times/week. Twenty-five of the 45 women (55.5%) walked regularly during pregnancy, while 22 reported regular walking (56%) after pregnancy. The one respondent who ran during pregnancy did so on a regular basis, as well as those respondents who ran after pregnancy (2/2). Trends showed that aerobics and "other" exercise were also done more consistently than the additional choices of exercise. Five of the six women performing aerobics did so three or more times per week during pregnancy, and five of eight participated in a regular program after pregnancy. "Other" exercise was performed by five of eight women during pregnancy and five of the seven women following childbirth. Appendix J summarizes specific findings.

The median number of months that women exercised during pregnancy was 6.5 months with a mode of 9 months. Half of the women started exercise within four weeks following childbirth while within two weeks was the most prevalent (mode) starting time.

Women were asked if at any time during pregnancy they performed PF exercise. Overall 71% of all the women surveyed said yes they performed the exercises with 51% occasionally performing the exercises. Out of the 54 women with vaginal deliveries, 40 (74%) responded that they performed these exercises. The majority (26/40) of the women performed these exercises on an occasional basis both during and after pregnancy. Twenty-two of thirty-three women who responded felt these exercises were beneficial. Eighteen of twenty-three women (78%) who had an episiotomy with any pregnancy reported that they performed PF exercises. The majority (11/18) occasionally performed these exercises both during and after pregnancy. Twelve of seventeen felt these were beneficial. Finally, four out of eight women experiencing a C-section responded that they performed PF exercises. All four performed these exercises both during and after childbirth. See Table 3 for complete data.

Twenty-six comments were made regarding whether women felt these exercises were beneficial. Seventeen of these women added comments explaining the advantages. Sixteen of the seventeen comments utilized a correct rationale for performing these exercises, such as for bladder control and PF muscle strength, while one woman did not understand the function of the PF muscles during labor. One negative comment was made, while eight women were unsure if the exercises were beneficial. Three of the eight women were unsure stating they only performed the exercises occasionally.

**Table 3. Pelvic Floor Exercises**

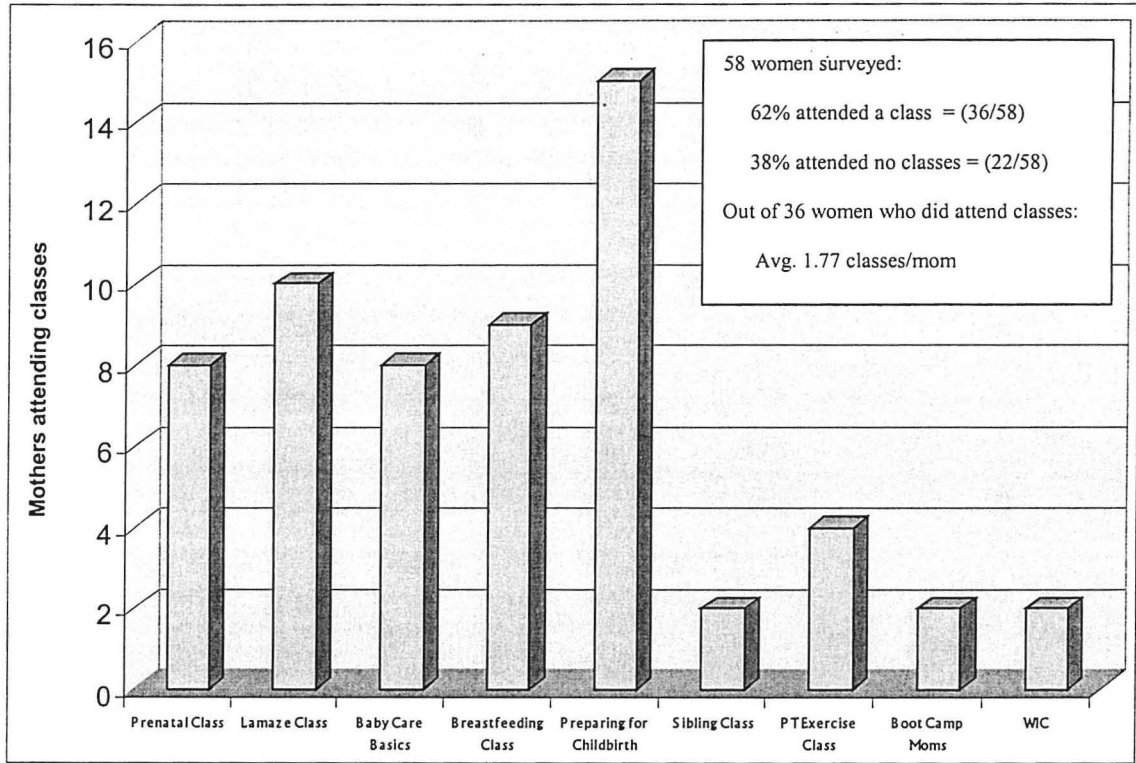
	Vaginal Delivery	Episiotomy	C-Section
Performed PF Exercises	$\frac{n}{N}$ 40/54 74%	$\frac{n}{N}$ 18/23 78%	$\frac{n}{N}$ 4/8 50%
When?	$\frac{n}{N}$	$\frac{n}{N}$	$\frac{n}{N}$
Prepartum	10/40	4/18	
Postpartum	4/40	3/18	
Both	26/40	11/18	4/4
How Often?			
Occasionally	20/40	10/18	2/4
1-9 times/day	14/40	6/18	1/4
10-20 times/day	6/40	2/18	1/4
Feel they were beneficial?			
Yes	22/33	12/17	2/3
No	3/33	1/17	
Unsure	8/33	4/17	1/3

### Classes

The majority of moms (62%) attended some type of pregnancy class, past or present pregnancies, in the childbearing year. Of these women, the most popular class to attend was a preparing for childbirth class (15/36). Women attended an average of 1.77 classes in the childbearing years (Figure 14).

Women commented on what information they thought was beneficial. All forty of the women responded positively, and ten of the women commented that all of the information was valuable. Breathing techniques (14) was the most popular theme

followed by breastfeeding (4) and what to expect (3). See Appendix J for a complete list of comments.



**Figure 14. Classes attended.**

## CHAPTER IX

### DISCUSSION

Our survey was constructed with the intent to explore various areas of concern to many health care providers throughout pregnancy, including physical therapists.

Statistics were collected on topics of particular interest including: musculoskeletal dysfunction and treatment received; information available promoting education and prevention; and the satisfaction and sufficiency of services available and utilized, including healthcare providers, in the Grand Forks and Devils Lake regions.

Numerous studies<sup>2-4,6,22,37</sup> have concluded women experience many musculoskeletal problems throughout pregnancy. This project supports the prevalence of problems reported in the literature, averaging 2.16 problems per participant. It was of no surprise that low back pain during pregnancy and stress incontinence were reported as the most commonly experienced problems in vaginal delivery and episiotomy populations. The prevalence of low back pain after pregnancy (one third of both vaginal and episiotomy groups) may suggest pain is a result of poor postural habits developed during pregnancy, and not solely the weight of the fetus primarily causing pain. It may also suggest that at six weeks post delivery, a woman's ligaments may still be lax also resulting in postpartum LBP prevalence. Even though no conclusions can be drawn due to small sample size, it is interesting to note all eight women undergoing a cesarean birth reported some type of back pain. The prevalence of low back pain in cesarean population has been suggested in the literature,<sup>12</sup> and could potentially result from increased



complications during delivery, and also unusual fetal position. This gives rise to possible future studies correlating low back pain and cesarean deliveries.

The second highest musculoskeletal problem, aside from LBP, reported in this survey was stress urinary incontinence, prevalent in 61% of the population undergoing episiotomy procedures. It is interesting to note that of those who experienced episiotomies, 78% reported performing pelvic floor exercises, with 61% reporting exercising both during and after pregnancy. Even though a high percentage of women performed pelvic floor exercises during pregnancy, a high prevalence of SUI was reported. This is in contradiction to the literature, which supports use of pelvic floor exercises to decrease incontinence.<sup>7(p122),14,21</sup> However, when analyzing these statistics, one must consider frequency, duration, and quality of technique used before drawing any substantial conclusions.

Possible reasons for this discrepancy found in our statistics may include improper instruction and technique, as brought up by one participant stating: "(I) was given a brochure when (I) mentioned PF problems to (my) doctor, with no coaching." This statement concurs with other researchers,<sup>14,17</sup> suggesting women are receiving appropriate information, but receive inadequate instruction resulting in incorrect technique and lack of benefits. Also contributing may be a result of inadequate performance regarding the frequency needed to see substantial decreases in incontinence. It is recommended to perform at least 50-100 repetitions per day,<sup>7</sup> which 20 out of 40 women responded they performed these exercises only on an occasional basis, which was not considered regularly or daily.

One of the most alarming issues confirmed in this project is the low rate of women actually seeking treatment for problems experienced. Out of all the women in our survey who responded as experiencing incontinence problems, only one reported seeking treatment. It is disturbing to think that women are suffering with issues such as these when proven successful treatment is available, but women fail to seek the proper help needed.

This survey's intent was to investigate prevalent problems associated with pregnancy. It is of interest to explore how many women view these conditions as a normal consequence of pregnancy rather than a treatable problem. These misconceptions were substantiated in the comment section with women stating: "(incontinence) part of life," "some leaking with sneezing, cross my legs," "(weak abdominals) nothing could be done," "(LBP) no need (for treatment), pain is normal." However, some women in our survey did realize these conditions are treatable. Comments from women seeking help included: "(painful intercourse) haven't sought treatment yet, but will at my next gynecological appointment," and "I'm trying the Kegel exercises. If they don't work I'll seek treatment." Refer to Appendix J for complete list of comments made throughout the survey.

The intention of our project was successfully accomplished, even though statistical significance was not obtained due to the small sample size noted in both episiotomy (23) and cesarean section (8) groups. Because of the small sample size, no correlational data could be concluded, however, specific trends were noted presenting opportunities for future studies or the continuation of this survey. Possibly contributing to the small sample was the reliance of other healthcare providers to hand out our surveys

to women at their six-week checkup appointment. Another factor to consider is the women participating in our survey may be more compliant than the general population, anticipating women who initiate regular check-ups are more likely to initiate and pursue appropriate treatment. Which leads into the next limitation, which is the survey only represents those women coming in for a scheduled appointment.

Other restrictions to our survey included subjective information and answers that were left to the discretion of the individual. It was questionable if participants fully understood these survey questions, especially regarding weak abdominal muscles and scar massage/mobilizations. An example of this was displayed when analyzing data concerning weak abdominals and women who had c-sections. Out of the eight women who had a c-section, only three reported they experienced weakness, when in reality, all eight should have answered yes considering undergoing a major surgical procedure only six weeks to six months prior. Scar massage information was also questionable due to results displaying women without episiotomy or c-section procedures report performing scar massage exercises. Statistics concerning pain with intercourse were not used because it did not specify if this pain was a result of other issues not related to pregnancy such as sexual abuse.

Information was also reported on aerobic exercise performed during and after pregnancy. The intent was to compare those who exercised and the prevalence of problems experienced, but again our sample size was too small to draw any conclusions. We did, however, see a trend in the number of women participating in a walking program throughout pregnancy. Theories for the prevalence of walking over other forms of exercise included: women may assume walking is the only safe form of exercise during

pregnancy and higher intensity exercise may be harmful for the fetus, women may have misinterpreted term 'aerobic' walking for day to day activities requiring walking (i.e. during work, or taking care of toddlers, etc.) and walking is very convenient.

When discussing various topics of importance throughout pregnancy, women were asked if they received any information concerning these specific areas and from whom/where. The majority of information was reported as received either through medical doctors and/or reading materials. This shows these women are seeking and receiving information, however, there still exists a prevalence of problems. This raises the question is the information women receive complete and comprehensive? Our survey found women attend approximately two classes (1.77) at some point throughout pregnancy. Good attendance gives the opportunity for information concerning pelvic floor, abdominals, posture, and scar to be appropriately implemented in order to minimize problems associated with these areas.

Although women reported they are satisfied with the services available to them, the statistics show certain key areas of concern throughout pregnancy are not being properly addressed or instructed. An evaluation should be done on the extent of information incorporated in the provided services, to gain insight of specific information offered to this population. Then, if needed, information concerning issues such as stress incontinence and low back pain can be emphasized in attempt to minimize problems prevalent throughout pregnancy. These areas of concern can be properly addressed by physical therapists involved in women's health, who have expertise on these issues. Presently their services appear to be underutilized. Physical therapists must continue to

encourage women to attend pre and postpartum classes in order to promote education and prevention in these areas.

### *Future Studies*

Information gathered from this survey brought many additional concerns and areas to investigate for further research. For example, a comparison study could be done on prevalent musculoskeletal problems evident in women receiving information / instructions for specific exercise (i.e. Kegel's) from trained health care providers, and those who gather information by utilizing reading material only. Another possible study could be longitudinal involving the benefits of pelvic floor exercises during delivery such as decreased tearing due to the awareness and ability to relax appropriate muscles. It would also be of interest to further research the prevalence of LBP in the cesarean birth population to see if the trend continues throughout a larger sample size. An exploration could be done concerning position of fetus and also the presence of anterior scar tissue, as possible correlations. Other areas of concern would be to further research scar massage benefits since there are few studies conducted in this area. Finally, it would be interesting to survey the medical doctors in the Grand Forks and Devils Lake areas to compare what information women report receiving in this study, and what information healthcare providers report providing.

Physical therapists must continue advocating women's health issues and utilize opportunities offered in education to promote better awareness. Misconceptions are still prevalent concerning pregnancy, and it is our job to encourage proper education and preventative measures in order to correct false or lacking information received. The childbearing year is a time of great change and demand on mothers, both emotionally and

physically. Physical therapists have the knowledge and skills required to treat this population, providing an opportunity for us to help women survive these times, without unnecessary complications of musculoskeletal dysfunctions.

APPENDIX A

## Handout for Pelvic Floor Exercises

### Exercise #1: The Stop Test

(Note: Advise women not to do this first thing in the morning and to do only once a week as a test only. Women with incontinence may have difficulty contracting the pelvic floor muscles in a gravity-resisted position.)

*Position:* Sit on the toilet. Spread legs apart for urination and support feet on a stool if voiding is difficult.

*Exercise:* As you urinate, stop and hold the flow of urine. Repeat a few times, breaking off the urine flow smoothly and completely. Try not to allow any dribbling of urine. Hold tightly for 5 seconds before starting urine flow.

*Progression:* Let smaller amounts of urine pass each time. Do not worry if this is difficult. Try to always end the voiding with an uplifting contraction of the pelvic floor.

### Exercise # 2 Long Contractions

*Position:* Lie on back or side with legs apart and chest relaxed.

*Exercise:* Draw pelvic floor upward. Feel the squeeze as the sphincters are tightened, and the inside passage becomes narrow and tense. Focus on the front portion of the pelvic floor where the master sphincter surrounds the vagina and the urethra. Initially, hold 10 seconds and then completely relax. Attempt to relax a little bit more, releasing any residual tension. Repeat 2 or 3 times, relaxing and repeating. Always end with a contraction.

*Progression:* Try other positions such as sitting, standing, and squatting. Do a total of 50 repetitions a day: 10 repetitions at a time, 5 sessions per day, holding each repetition for 10 seconds. Relax between each contraction.

### Exercise # 3 Quick Contraction

*Position:* Lie on back or side with legs apart and chest relaxed.

*Exercise:* Draw pelvic floor upward. Feel the squeeze as the sphincters are tightened, and the inside passage becomes narrow and tense. Focus on the front portion of the pelvic floor where the master sphincter surrounds the vagina and the urethra. Initially, hold 2-3 seconds and completely relax. Attempt to relax a little bit more, releasing any residual tension. Repeat 2 or 3 times, relaxing and repeating. Always end with a contraction.

*Progression:* Try other positions such as sitting, standing, and squatting. Do a total of 50 repetitions a day: 10 repetitions at a time, 5 sessions per day, holding each repetition for 3 seconds. Relax between each contraction.

### Exercise # 4 The Elevator

*Position:* Assume any position, although lying down is easier at first.

*Exercise:* Imagine you are in an elevator on the first floor. As you ascend to each floor, draw up the pelvic floor muscles a little bit more. When you reach your limit, do not let go, but descend floor by floor, gradually relaxing the pelvic floor in stages. When you have reached the first floor, think about releasing, and continue to the basement. Do not hold your breath, blow out through pursed lips. Feel the perineal muscles bulge. Complete this exercise by bringing the pelvic floor back up to the ground.

### Exercise # 5 The Sexercise

*Position:* Assume any position of coitus with the legs spread apart and relaxed.

*Exercise:* Grip the penis as firmly as you can with your vagina, holding for 5 seconds before you relax. Try to avoid tensing the buttocks and the abdominal muscles. Repeat a few times until your partner tells you the strength of the contractions has diminished. Rest and repeat in a few minutes.

*Progression:* Your muscle strength will increase as you learn to make the contractions stronger, more consistent and more numerous.

[Adapted from Stephenson, G. Obstetric and Gynecologic Care in Physical Therapy: 124.<sup>7</sup>]

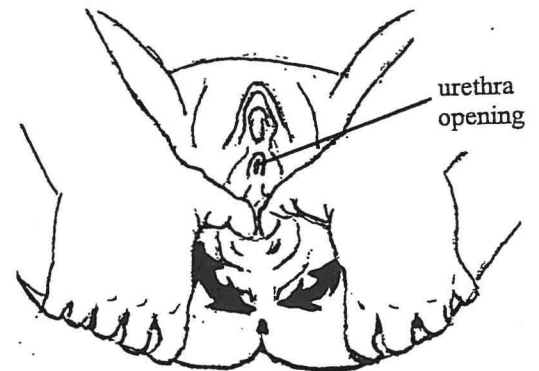
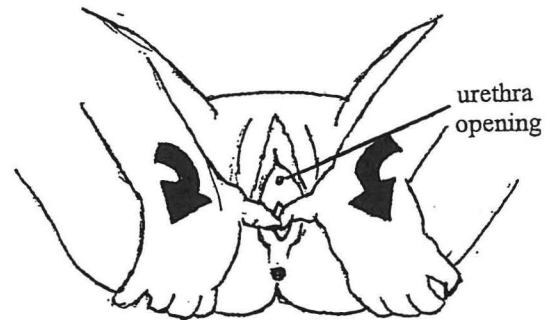


APPENDIX B

## Perineal Stretching Techniques

Massaging the perineum (skin around the vaginal opening) daily for the last 6 weeks of pregnancy may help avoid the need for an episiotomy and/or prevent tearing during delivery. This technique gradually stretches the vaginal and perineal tissues, rather than expecting them to respond to an intense stretch during delivery. It is also helpful to learn to strengthen and relax your pelvic floor muscles by doing Kegel (or pelvic floor) exercises throughout your pregnancy.

1. The massage should be done daily for 5-10 minutes, starting about six weeks before your due date (or 34 weeks gestation).
2. Make sure your bladder is empty and that you are propped up comfortably. A warm bath may help you relax and soften your perineum. Use a mirror the first few times until you become familiar with the area you are massaging.
3. Massage a natural oil (wheat germ oil, olive oil, or plain salad oil) into the tissues of the perineum and just inside the vagina. Pay special attention to any scar tissue from past episiotomies or tears.
4. Put your thumbs (or have your partner put both index fingers) about 2 inches into vagina and press downward toward the rectum. While maintaining gentle, steady pressure, the fingers should move upward along the sides of the vagina, in a rhythmic "U" movement. Avoid rubbing the urinary opening located directly above vagina.
5. As you massage each day, your tissues should relax and stretch. Gently stretch vaginal opening as wide as possible each session. You should feel a slight tingling or burning sensation, which will also mimic the feeling of the baby's head beginning to crown.
6. Hold this painfree stretch for 45-60 seconds and then release. Massage with more oil and repeat the stretch one more time.



APPENDIX C

## Post-Cesarean Exercise Program

### Day 1

1. Diaphragmatic breathing: mother splints incision with her hands or a splint pillow while performing deep breathing.
2. Mid-chest expansion: mother puts hands along the side of the lateral chest wall while directing air into lungs so that ribs expand into her hands.
3. Upper chest expansion: mother places one hand over the sternum, the thumb and fingers are over the clavicle, while she directs the chest expansion into her hand.
4. Huffing: mother splints incision and breathes in through the nose and on exhalation, she repeats a forced “Ahhhh.”
5. Pelvic floor exercises

### Day 2 and 3

All of the Day 1 exercises should be done plus:

1. Pelvic tilt: sidelying or sitting positions.
2. Leg slides: knees bent lying on back, pull stomach in, flatten back, slide one leg up and down, maintaining pelvic control. Do not extend legs down fully.
3. Hula: lying supine, legs flat; hike hip up and down.

### Day 4 and 5

If mother is up and about easily, discontinue breathing exercises.

1. Check for diastasis recti abdominis and do corrective exercises, if needed; mother crisscrosses hands across abdomen, approximating the rectus abdominis and lifts head up.
2. Partial lower trunk rotation: on back, knees bent, shoulders flat, knees drop together from side to side, head turns in opposite direction of the knees.

### Day 6

Do all exercises as previously listed, plus:

1. Pelvic tilt: on all fours, then gradually add more challenging abdominal exercises, including the oblique muscles.

[Adapted from Frahm J: Hutzell Hospital Physical Therapy Department. Post-Cesarean Exercise Program.<sup>82</sup>]

APPENDIX D

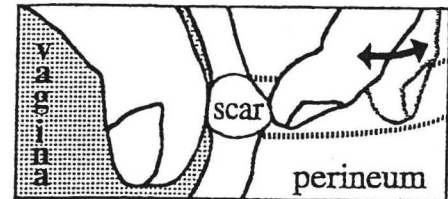
## How To Massage

Within five to ten days the stitches will dissolve. Once this happens, you can begin to massage the tissues between the vagina and anus. Insert your thumb into your vagina while keeping the index finger over the perineal body above the scar. Gently roll the tissue between thumb and finger. Use a warm compress to get started. This will relax the muscles and allow you to touch yourself with less discomfort.

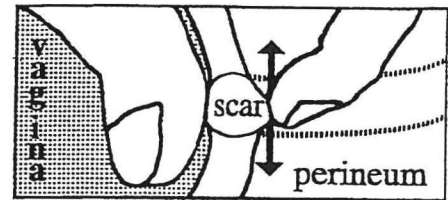
**TIP: Scar tissue? Anus? Vagina? Stick your thumb in? If you find this embarrassing, read it twice! The muscles in this region are crucial to your health and well being . They support your internal organs, play a role in sexual function, and maintain continence of both bladder and bowel. Learn to touch, look at, move, and think about this part of your body. It will help you heal faster and stay healthier.**

**You can massage the scar tissue from an episiotomy or tear in three directions.**

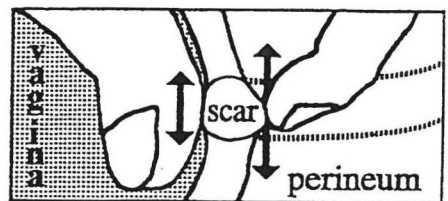
With the grain (working along the line of the scar).



Against the grain (working across the scar).



By rolling the scar between the thumb and forefinger.



As the scar is massaged it will become smaller, more elastic, and less tender. This permits the tissues of the muscles to regain their function without getting stuck to one another and it reduces the interference of thick masses of scar tissue.

If scar tissue has adhered and is causing discomfort during intercourse, you should have a medical practitioner, either an ob/gyn, a midwife, or a physical therapist specializing in women's health, evaluate your condition. They will help you learn self-massage and will be able to apply deep heating ultrasound to the affected area. (This is not the same ultrasound used to view your baby inside you.) Four or five ultrasound treatments coupled with massage will often make the scarred area painless to the touch and intercourse less uncomfortable.

APPENDIX E

## Scar Mobilization

An incision long enough to accommodate your baby leaves a long scar. Even if the scar is low on your belly and scarcely visible, it could use some attention from you. Scar mobilization means just what it sounds like, moving the scar tissue around using simple massage techniques.

### Why Do It?

Once your incision is healed, it's important to prevent the scar tissue from adhering to the muscle layers deeper inside. Remember that your incision penetrated all the way through skin, muscles, and uterus. Scar tissue can be quite deep.

### When To Begin

You can begin to lightly massage your scar as soon as the incision has healed and the staples or stitches are out. Be gentle when you first begin, and if you feel any discomfort, stop and be much gentler. Your eventual goal is to move the skin and the muscles underneath so that they seem to slide freely over one another.

In most cases scar tissue and its tendency to adhere to muscle, can be dealt with by you. Your scar can be lifted and separated from healthy muscle tissue to reduce or eliminate adhesion. This scar mobilization will actually reduce the amount of scar tissue. As you loosen the scar, it may also take away any feelings that you have of pinching or pulling your lower belly as you reach for things on a high shelf.

There is no final time limit for working on scars. You can begin two years after a cesarean or episiotomy and still make the scar softer, thinner, and less visible.

### How To Do It

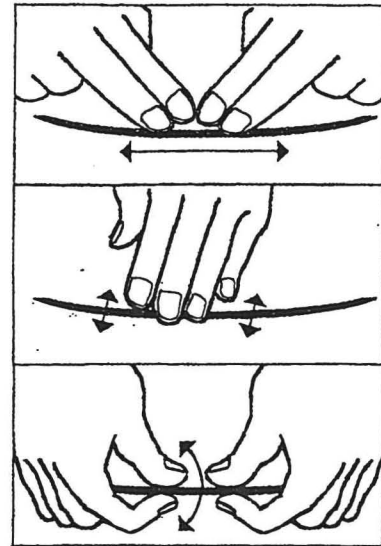
Some people are reluctant to touch the scar or even the whole general area of the incision. If you feel this way, begin by lightly touching and stroking yourself, first with your palms and then with your fingertips. If this is too hard, begin by using a soft, clean cloth. Use a mirror to closely examine your scar. Nobody is going to be gentler or more thoughtful about your healing than you yourself.

Begin scar mobilization by rubbing your hands together to warm them up. You can use warm compresses or neutral oils, if they make you more comfortable or make the massage pleasanter, but they aren't necessary. If oil appeals to you, use a little, but don't make the skin so slippery that you can't get a good hold on the scar tissue.

Massage the scar tissue by working it with a rubbing motion along the grain (along the line of the scar).

Stroke back and forth against the grain (across the scar).

Roll the scar between your thumb and your forefinger.



To get the maximum benefit, the massage should be done 2-3 times a day for 5-10 minutes at a time. The more you massage the scar, the more pliable, soft, thin, and cosmetically appealing it will become. Don't rub so hard that it hurts. At the end, hold the ends of the scar. Gently push and pull it back and forth and from side to side for a minute or two. You can expect to feel and see results in three to four weeks. Don't worry about not always doing the full time, every little bit will help.

Reprinted with permission from: How to Raise Children without Breaking Your Back. © 1995 Alex Pirie, IBIS Publications. P.O. Box 441474.<sup>63</sup>



APPENDIX F

## Scar Massage after Abdominal Surgery

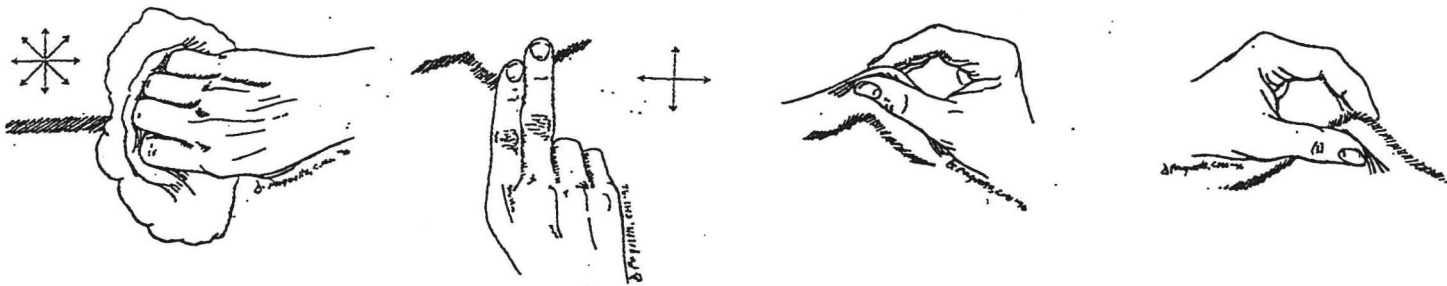
Begin scar massage as soon as possible after surgery. When the scab has fallen off and there is no seepage from the scar (at least two weeks), you may begin with step 1. The benefit is greatest when the skin is worked just below the pain threshold as firmly as possible. However, it is very important to start gently and progress slowly to deeper and stronger massage. You should never feel sharp stabbing pain. A strong pulling sensation or a light burning is okay. We recommend 5-15 minutes per day. Some people find that after showering or bathing is a more comfortable time to perform scar massage. Do not slide across the skin. Do not use lotion or oil.

### 1. Scar Desensitization

### 2. Push and Pull

### 3. Skin Rolling

### 4. Plucking



1. Scar Desensitization: Use a rough wet towel to rub across the scar in all directions. Repeat with a dry towel if tolerated. This will help to decrease the sensitivity of the scar and help you feel more at ease touching it.

2. Push and Pull: Place two fingers directly on the scar and move it slowly straight toward the ribs. When the skin stops moving, continue to help firm pressure on the scar for 1 to 2 minutes. This should produce a strong pulling sensation, but should not cause sharp pain. Repeat to down to pubic bone, to right, and to left in a similar manner. You may notice one or two directions that feel especially "stuck." Spend a little more time holding in those directions.

3. Skin Rolling: Pinch the skin on either side of the scar, lifting the skin up. Start at either end and move forward and backward, rolling and raising the skin as you move. A free scar bulges upward. A stuck scar dimples inward. Try this 2-4 weeks after surgery.

4. Plucking: Put your index finger on one side and the thumb on the other side of the scar. Attempt to pick up the scar, separating it from the underlying tissue. If you can get under the scar, move your fingers slightly from side to side for 1-2 minutes. Start at either end and work toward the center. If the skin slips out of your fingers, you may not be ready for this stage, but keep trying. Begin this 4-8 weeks after surgery.

Adapted from: Wilder E. The Gynecological Manual: American Physical Therapy Association:280-281.<sup>8</sup>

APPENDIX G

## American College of Obstetricians and Gynecologists (ACOG) Recommendations for Exercise in Pregnancy and Postpartum

- During pregnancy, women can continue to exercise and derive health benefits even from mild to moderate exercise routines. Regular exercise (at least 3 times per week) is preferable to intermittent activity.
- Women should avoid exercise in the supine position after the first trimester. Such a position is associated with decreased cardiac output in most pregnant women. Because the remaining cardiac output will be preferentially distributed away from splanchnic beds (including the uterus) during vigorous exercise, such regimens are best avoided during pregnancy. Prolonged periods of motionless standing should also be avoided.
- Women should be aware of the decreased oxygen available for aerobic exercise during pregnancy. They should be encouraged to modify the intensity of their exercise according to maternal symptoms. Pregnant women should stop exercising when fatigued and not exercise to exhaustion. Weight-bearing exercises may under some circumstances be continued at intensities similar to those prior to pregnancy throughout pregnancy. Non-weight bearing exercises, such as cycling or swimming, will minimize the risk of injury and facilitate the continuation of exercise during pregnancy.
- Morphologic changes in pregnancy should serve as a relative contraindication to types of exercise in which loss of balance could be detrimental to maternal and fetal well-being, especially in the third trimester. Further, any type of exercise involving the potential for even mild abdominal trauma should be avoided.
- Pregnancy requires an additional 300 kcal/day to maintain metabolic homeostasis. Thus, women who exercise during pregnancy should be particularly careful to ensure an adequate diet.
- Pregnant women who exercise in the first trimester should augment heat dissipation by ensuring adequate hydration, appropriate clothing, and optimal environmental surroundings during exercise.
- Many of the physiologic and morphologic changes of pregnancy persist 4 to 6 weeks postpartum. Thus, prepregnancy exercise routines should be resumed gradually based on a woman's physical capability.

*ACOG Technical Bulletin 189*<sup>64</sup>.

APPENDIX H

Dear Patient:

We, Tami Parker and Christel Parvey, physical therapy students at the University of North Dakota are conducting a survey on the available services and information provided to you throughout your pregnancy. As women in the childbearing years, we were hoping you might provide some assistance for our enclosed survey. This survey will provide us information regarding the awareness of women on various issues related to pregnancy and the services needed and utilized. Our intent is to advance awareness in women's health issues and provide direction for program development to benefit the health and wellness of women in their childbearing years. This information will be used in our graduate project in Physical Therapy at the University of North Dakota.

We would like to invite you to voluntarily complete this survey. Criteria includes that you have given birth within the last six months and are over 18 years of age. The survey should take approximately four to eight minutes to complete and when finished, seal it in the envelope provided to you. No identifying information is on your survey, therefore results reported will be completely confidential. Please return this sealed envelope to your nurse or front desk receptionist when finished.

This project will benefit both health care professionals and you as consumer of these services. By gaining awareness, we hope you feel that you can discuss some of these issues with your doctors or seek treatment for these conditions (including low back pain or dribbling urine). In addition, health care professionals will achieve a better understanding of what issues are not addressed and need to be.

Regardless of your participation or lack of participation in this study, it will not affect your relationship with the clinic facility or the University of North Dakota. If you have questions, please feel free to discuss these issues with your doctor. In addition, there are local physical therapists that are qualified and treat women with some of these same problems.

Laurie Betting, MPT	Healthisouth Grand Forks, ND
Leatha Vaagen, MPT	Healthisouth Devils Lake, ND
Megan Boyd, MPT	Altru Health Institute Grand Forks, ND

Thank you for your time and cooperation.

Sincerely,

Tami Parker and Christel Parvey  
Graduate Physical Therapy Students  
University of North Dakota

Today's Date: \_\_\_\_\_ Your Age: \_\_\_\_\_

- 1) Where did you receive your prenatal/postnatal care?
- Altru Family Medicine Center, Grand Forks
  - Altru Main Clinic OBGYN, Grand Forks
  - UND Family Practice, Grand Forks
  - Lake Region Clinic, Devils Lake
  - Other \_\_\_\_\_

- 2) Number of full term pregnancies: \_\_\_\_\_ Age of children: \_\_\_\_\_
- Have you had any of the following (if yes, indicate **how many**):
- miscarriages \_\_\_\_\_
  - episiotomies \_\_\_\_\_
  - vaginal deliveries \_\_\_\_\_
  - cesarean births \_\_\_\_\_

- 3) Have you experienced or had any of the following:
- |   |                          |                          |  |
|---|--------------------------|--------------------------|--|
|   | <u>Yes</u>               | <u>No</u>                |  |
| Weak abdominal muscles  | <input type="checkbox"/> | <input type="checkbox"/> | If yes, did you seek treatment? Y / N<br>Explain _____ |
| Low back pain   |                          |                          |  |
| a) During pregnancy   | <input type="checkbox"/> | <input type="checkbox"/> | If yes, did you seek treatment? Y / N                  |
| b) After childbirth   | <input type="checkbox"/> | <input type="checkbox"/> | Explain _____  |
| Leaking urine   |                          |                          |  |
| a) when coughing/<br>sneezing/lifting<br>heavy objects/running? | <input type="checkbox"/> | <input type="checkbox"/> | If yes, did you seek treatment? Y / N<br>Explain _____ |
| b) when unable to get<br>to the bathroom in time                | <input type="checkbox"/> | <input type="checkbox"/> | Explain _____  |
| Pain with intercourse   | <input type="checkbox"/> | <input type="checkbox"/> | If yes, did you seek treatment? Y / N<br>Explain _____ |

4) Which activities did you perform **during** and **after** pregnancy? (Please check **all** that apply.)  
*If you exercised occasionally, please specify how many times **per month**.*

Activity	DURING: # of times/week	AFTER: # of times/week
Walking		
Biking		
Swimming		
Aerobics		
Running		
Weight Lifting		
Other:		
I did not exercise:	<input type="checkbox"/> During pregnancy	<input type="checkbox"/> After pregnancy

5) How many months of your pregnancy did you exercise? \_\_\_\_\_

6) If you are exercising, how soon did you start *after* childbirth? \_\_\_\_\_

7) Did you receive information on exercise guidelines *during* pregnancy?  
(If yes, check *all* that apply.)

MD=Doctor	NP=Nurse Practitioner	N=Nurse	PT=Physical Therapist
ExC=Exercise Class	PreC=Prenatal Class	Books=All reading materials	

	<u>MD</u>	<u>NP</u>	<u>N</u>	<u>PT</u>	<u>ExC</u>	<u>PreC</u>	<u>Books</u>
Y / N <b>How hard/how often to exercise</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y / N <b>Pelvic floor exercises</b> (Kegel's)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y / N <b>Scar massage/mobility</b> (for prevention of tears/episiotomies)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y / N <b>Breathing techniques</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y / N <b>Physical changes</b> (balance, posture, joint instability)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8) Did you receive information on exercise guidelines *after* childbirth?  
(If yes, check *all* that apply.)

	<u>MD</u>	<u>NP</u>	<u>N</u>	<u>PT</u>	<u>ExC</u>	<u>PreC</u>	<u>Books</u>
Y / N <b>How hard/how often to exercise</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y / N <b>Pelvic floor exercises</b> (Kegel's)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y / N <b>Scar massage/mobility</b> (Applicable if tear/episiotomy/cesarean)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y / N <b>Correct Lifting Techniques</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9) Please specify what types of classes you attended? \_\_\_\_\_

10) What information do you feel was the most beneficial? \_\_\_\_\_

11) What else might have been helpful? \_\_\_\_\_

12) Do you perform scar massage/mobility? Y / N      If yes, how often?  
 0-1 times/week     2-4     5-7     I occasionally perform but not on a regular basis

13) Do you perform pelvic floor exercises (Kegel's)?      Y / N (If yes, complete a-c)  
 a) When did or do you perform these exercises?  
 During Pregnancy       After Pregnancy     Both  
 b) How often?  
 1-9 times/day     10-20     25-40     50-65     80+  
 I occasionally perform these exercises but not on a regular basis  
 c) Did you feel these exercises are beneficial? Why or why not \_\_\_\_\_



APPENDIX I

EXPEDITED REVIEW REQUESTED UNDER ITEM \_\_\_\_\_ (NUMBER[S]) OF HHS REGULATIONS  
EXEMPT REVIEW REQUESTED UNDER ITEM 2 (NUMBER[S]) OF HHS REGULATIONS

UNIVERSITY OF NORTH DAKOTA HUMAN SUBJECTS REVIEW FORM  
FOR NEW PROJECTS OR PROCEDURAL REVISIONS TO APPROVED  
PROJECTS INVOLVING HUMAN SUBJECTS

use include ALL information and check ALL blanks that apply.

PRINCIPAL INVESTIGATOR: Tami Parker / Christel Parvey TELEPHONE: 787-5689 DATE: 6-23-00  
772-0025  
ADDRESS TO WHICH NOTICE OF APPROVAL SHOULD BE SENT: 1106 28 Ave S Apt 15, Grand Forks, ND 58201  
SCHOOL/COLLEGE: Medicine and Health Sciences DEPARTMENT: Physical Therapy PROJECT DATES: 7-5-00 — 10-30-00  
(E.g., A&S, Medicine, EHD, etc.) (Month/Day/Year)  
PROJECT TITLE: "Determining the Need for Program Development for Women in Their Childbearing Years"

SPONSORING AGENCIES (IF APPLICABLE): NA

TYPE OF PROJECT (Check ALL that apply):

NEW PROJECT  CONTINUATION  RENEWAL  DISSERTATION OR THESIS RESEARCH  STUDENT RESEARCH PROJECT  
 CHANGE IN PROCEDURE FOR A PREVIOUSLY APPROVED PROJECT

DISSERTATION/THESIS ADVISER, OR STUDENT ADVISER: Beverly Johnson, Associate Professor of Physical Therapy

PROPOSED PROJECT:  INVOLVES NEW DRUGS (IND)  INVOLVES NON-APPROVED USE OF DRUG  INVOLVES A COOPERATING INSTITUTION

IF ANY OF YOUR SUBJECTS FALL IN ANY OF THE FOLLOWING CLASSIFICATION, PLEASE INDICATE THE CLASSIFICATION(S):

MINORS (<18 YEARS)  PREGNANT WOMEN  MENTALLY DISABLED  FETUSES  PERSONS WITH  
 PRISONERS  ABORTUSES  GRADUATE STUDENTS (>18 YEARS)

IF YOUR PROJECT INVOLVES ANY HUMAN TISSUE, BODY FLUIDS, PATHOLOGICAL SPECIMENS, DONATED ORGANS, FETAL TISSUE, OR PLACENTAL MATERIALS, CHECK HERE

IF YOUR PROJECT HAS BEEN/WILL BE SUBMITTED TO ANOTHER INSTITUTIONAL REVIEW BOARD(S), PLEASE LIST NAME OF BOARD(S): \_\_\_\_\_

Status:  Submitted; Date \_\_\_\_\_  Approved; Date \_\_\_\_\_  Pending

ABSTRACT: (LIMIT TO 200 WORDS OR LESS AND INCLUDE JUSTIFICATION OR NECESSITY FOR USING HUMAN SUBJECTS.)

Acting as a clinician, educator, or consultant, physical therapists can offer a variety of services that would benefit women in their childbearing years. This population is frequently overlooked despite many prevalent problems associated with childbirth. In a study by Gaard and Andersson<sup>1</sup>, low back pain continued to be a problem in 37% of women 18 months following childbirth. Another study reports diastasis recti abdominis occurring as high as 67% during pregnancy and at a rate of 36% in a later postpartum group.<sup>2</sup> Stress urinary incontinence was experienced by 39% of a sample before, during, or after pregnancy<sup>3</sup> and the United States spent 11.2 billion dollars annually managing incontinence in these community dwellers.<sup>4</sup>

The purpose of this study is to develop an understanding of what interventions are currently offered in the Devils Lake and Grand Forks communities to pre and postpartum women and compare it to an ideal treatment protocol addressing pelvic floor muscles, abdominals, posture, scar mobilization, and the cardiovascular system. Our study will be accomplished via a survey and will provide a foundation for program development to benefit the health and wellness of women in their childbearing years.

\*(See attached references.)

**BASE NOTE:** Only information pertinent to your request to utilize human subjects in your project or activity should be included on this form. Where appropriate attach sections from your proposal (if seeking outside funding).

**PROTOCOL:** (Describe procedures to which humans will be subjected. Use additional pages if necessary. Attach any surveys, tests, questionnaires, interview questions, examples of interview questions (if qualitative research), etc., the subjects will be asked to complete.)

Sample: All post partum women who are receiving postnatal care in the Grand Forks or Devils Lake regions and are over 18 years old may voluntarily participate and be included in this project.

The Instrument: A two-page survey will be given to the participants. This will include a cover letter explaining the benefits, confidentiality, guarantee of confidentiality, and a statement of voluntary participation to begin this survey. Patients will be given the names of health care professionals in physical therapy if concerns arise and wish to seek treatment. Also they will be encouraged to speak to doctors on these issues.

University of North Dakota (UND) Physical Therapy students developed the questionnaire with the assistance of UND faculty, Associate Professor Bev Johnson and UND Instructor Cindy Flom-Meland. It was revised by three physical therapists actively working in women's health issues: Laurie Betting, Leatha Vaagen, and Megan Boyd. Finally, it is supported by local prominent physicians in this field (See attached letter.)

This survey requests information in both a quantitative and qualitative format. Data will include information and services received during and after pregnancy (See attached survey.)

The Procedure: The survey will be provided to the nurses of appropriate doctors who have approved this project. It will be filled out by the nurses at a woman's six-week appointment following childbirth and filled out while the client waits for her appointment. An enclosed envelope will be provided along with the survey. The patient is to seal the survey in the envelope and turn it to the nurse or receptionist upon completion of the appointment to be stored in a file cabinet until picked up by the investigators. The sealed envelope will help guarantee confidentiality. The investigators will collect these surveys on a weekly basis over a period of 2-3 months.

Data Analysis: Traditional descriptive and analytical statistics will be used to assess the need for program development and assess awareness and compliance in women of childbearing years. We will use the information that is actually being provided to these women and compare it to an ideal or optimal program based on a literature review. Alpha for all tests will be set at .05.

Data Reporting: Results of this survey will be described in the Independent Study Report. Health care professionals can then use this information to develop programs and better address issues that are missed between professionals to better serve their patients. The report will be made available upon completion in the University of North Dakota Harley French Medical Library.

**ENEFITS:** (Describe the benefits to the individual or society.)

The participants in this study will develop an increased awareness of women's health issues. The patients may be encouraged to seek to their doctors and seek treatment when problems arise.

Health care professionals will achieve a better understanding of what issues are not addressed due to the patients' lack of knowledge and services. Then they can provide direction for program development to benefit the health and wellness of women in childbearing years.

All women can be benefited by receiving optimal care and information that may reduce and even prevent problems associated with childbirth. Furthermore health care professionals will be more educated and therefore will better serve the needs of their patients.

**RISKS:** (Describe the risks to the subject and precautions that will be taken to minimize them. The concept of risk goes beyond physical risk and includes risks to the subject's dignity and self-respect, as well as psychological, emotional or behavioral risk. If data are collected which could prove harmful or embarrassing to the subject if associated with him or her, then describe the methods to be used to protect the confidentiality of data obtained, debriefing procedures, storage of data, how long data will be stored (must be a minimum of three years), final disposition of data, etc.)

The risks to those filling out the survey are minimal. We will assume to have the patient's consent if the survey is completed and returned because the survey is voluntary. There will be no identifying information on the survey. Storing the survey in a locked file for three years at the University of North Dakota will ensure confidentiality. The surveys will be destroyed following this three-year period.

**CONSENT FORM:** Attach a copy of the **CONSENT FORM** to be signed by the subject (if applicable) and/or any statement to be read to the subject should be attached to this form. If no **CONSENT FORM** is to be used, document the procedures to be used to assure that infringement upon the subject's rights will not occur.

Describe where signed consent forms will be kept and for how long (must be a minimum of 3 years), including plans for final disposition or destruction.

The risks to those filling out the survey are minimal. We will assume to have the patient's consent if the survey is completed returned because the survey is voluntary. There will be no identifying information on the survey. Storing the survey in a locked file for three years at the University of North Dakota will ensure confidentiality. The surveys will be destroyed following this three-year period.

For **FULL IRB REVIEW** forward a signed original and fifteen (15) copies of this completed form, including fifteen (15) copies of the proposed consent form, questionnaires, examples of interview questions, etc. and any supporting documentation to the address below. An original and 19 copies are required for clinical medical projects. In cases where the proposed work is part of a proposal to a potential funding source, one copy of the completed proposal to the funding agency (agreement/contract if there is no proposal) must be attached to the completed Human Subjects Review Form if the proposal is non-clinical; 7 copies if the proposal is clinical medical. If the proposed work is being conducted for a pharmaceutical company, 7 copies of the company's protocol must be provided.

Office of Research & Program Development  
University of North Dakota  
Grand Forks, North Dakota 58202-7134

On campus, mail to: Office of Research & Program Development, Box 7134, or drop it off at Room 105 Twamley Hall.

For **EXEMPT** or **EXPEDITED REVIEW** forward a signed original, including a copy of the consent form, questionnaires, examples of interview questions, etc. and any supporting documentation to one of the addresses above. In cases where the proposed work is part of a proposal to a potential funding source, one copy of the completed proposal to the funding agency (agreement/contract if there is no proposal) must be attached to the completed Human Subjects Review Form.

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policies and procedures on Use of Human Subjects of the University of North Dakota apply to all activities involving use of Human subjects performed by personnel conducting such activities under the auspices of the University. No activities are to be initiated out prior review and approval as prescribed by the University's policies and procedures governing the use of human subjects.

**NATURES:**

\_\_\_\_\_  
Principal Investigator

\_\_\_\_\_  
Date

\_\_\_\_\_  
Project Director or Student Adviser

\_\_\_\_\_  
Date

\_\_\_\_\_  
Sponsoring or Center Grant Director

\_\_\_\_\_  
Date

APPENDIX J

## SURVEY COMMENTS

### 1) Was Treatment Sought for Problems Identified? \*

(\*Although many women made comments in the treatment section provided, few women actually selected yes to receiving treatment.)

#### a) Problem: Weak Abdominal Muscles

"This last delivery"

"Yes, nothing could be done."

"Yes, physical therapy for one month. Pelvic bone shifting"

#### b) Problem: Low Back Pain During and/or After Pregnancy

"Just at the end of pregnancy and the first week after exercise"

"Physical therapy and chiropractor adjustments for sciatica"

"Just during the first pregnancy"

"It came with my blood clot."

"Discussed with Doctor"

"One session with a PT to learn some stretches"

"No need pain was normal"

"Back labor both pregnancies"

"Tylenol"

"Pulled muscle (massage and cool/warm pack at home)"

"My husband is a PT and had a yoga video that showed various positions to relieve pain"

"Took aspirin during pregnancy and now also"

"Offered therapy which didn't help"

"Tylenol takes the pain away."

"No treatment sought, but not that serious."

"Yes sought treatment with the first child. PT and Chiropractor"

"Sought treatment at GFAFB Physical Therapy for back manipulation."

"Yes, pain killers"

"No treatment sought. LBP due to injury after birth."

"Chiropractor"

"Not severe enough to seek treatment"

#### c) Problem: Leaking Urine (Stress and/or Urge Incontinence)

"When sneezing at the end of pregnancy"

"Kegel exercises are helping"

"While pregnant (time will tell if it goes away. So far no problem ?sneezing)"

"Some leak with sneezing (cross legs when sneeze)"

"I'm trying the Kegel exercises. If they don't work I'll seek treatment."

"Told to do Kegel exercises which did not help"

"Part of life"

"I'd read enough to know that this is fairly common in early weeks following pregnancy. The type b (urge) leakage only occurred twice in the first week after birth. I've been trying to do some Kegel exercises and the type a (stress) leakage is now quite rare for me."

**d) Problem: Pain with Intercourse**

"After both pregnancies up to 6 months after birth and during 2<sup>nd</sup> pregnancy"

"Doctor just kept telling me to wait or quit having sex. Was not at all helpful."

"Follow-up check up if continues."

"Yes painful intercourse. Haven't sought treatment yet but I will at my next gyn appointment."

"Not yet. Want to give myself a little more time to heal."

"Yes, talked to doctor at 6 weeks. Check-up for recommendations."

**2) Other Exercise**

Exercise

Stretching

Physical therapy daily

Volleyball (once awhile for the first trimester only)

Stair stepper

Nordic Track

Softball

Figure skating

Rollerblading

Rollerblading

Abdominal exercises

Tae Bo

Active mom of a toddler (was most of my exercise)

Active mom (chasing 5 year old and 19 month old infant enough for now; I bounce back to pre weight easily)

**3) What Information Do You Feel is Most Beneficial?**

"Labor preparation"

"The refresher labor and delivery course"

"Breathing and Pushing Instructions"

"Lamaze"

"Lamaze"

"Lamaze"

"All classes were really helpful especially prenatal."

"Knowing what to expect during and after labor"

"What to expect upon arrival when in labor"

"What to expect"

"Correct breathing techniques"

"Breathing techniques"

"Breathing techniques"

"Breathing"

"Breathing techniques and drug info"

"Breathing techniques and pain management in labor"

"Breathing"



"Breathing techniques"  
"Breathing and relaxing techniques"  
"Relaxation techniques"  
"Breastfeeding information"  
"Breastfeeding while in hospital"  
"Breastfeeding"  
"How to breastfeed since that was very important to me."  
"Bathing your baby"  
"Kegels"  
"The most helpful information I got was from books."  
"Books"  
"Posture"  
"MD information"  
"MD information on food restrictions that aided in retaining my prepregnancy shape and size."  
"Pain control options"  
"All, sought PT for back manipulation"  
"Everything"  
"All of it"  
"All of it"  
"All of it"  
"All of it was very helpful to me being a first time mother."  
"Everything"  
"All info"

#### 4) What Else May Have Been Helpful?

"In Lamaze class, there should be more information on recovery after vaginal birth."  
"Talking to more moms"  
"Since the survey brought it up, I realized that more can be discussed regarding exercise pre and post."  
"Don't know"  
"Day by Day book"  
"Yoga for pregnancy (Gives breathing and concentrating techniques, balancing and strength position, how to relieve low back pains, etc.) I strongly recommend a class for this."  
"More on breastfeeding"  
"More info on life after the birth"  
"Having a MD sensitive to mood and emotional changes during pregnancy. Depression is very real and very serious- it can lead to much emotional pain and can be harmful and even fatal!! It's too easy for doctors to tell you it's hormones and send you home even if you are telling them you are seriously depressed."  
"Talking with my doctor about episiotomies before I tore during childbirth."  
"I feel exercise is very important and I wish I would've had more information on it."

"More info on how and when to know you're in labor."  
"A full time cleaning lady/cook the first month. Seriously, I wish someone would have emphasized it more how to take it easy the first month, and everything changes after that-you feel better and the baby feels better, etc."  
"Scar massage"  
"Someone to exercise with"  
"Back manipulations twice a week"  
"More books"  
"After c-section to know when can exercise and have intercourse"  
"Covered everything very well"

**5) Do You Feel Pelvic Floor Exercises are Beneficial? (why or why not):**

"Yes, it strengthens the muscles."  
"Yes, strengthen pelvic muscles"  
"Yes, it helped me strengthen for child birth and after birth also."  
"Yes, they strengthen pelvic floor muscles and decrease leakage."  
"Yes, it helped me with my leaking urine problems."  
"Yes, my leakage is very rare now and would probably go away if I did them more regularly."  
"Yes, I need to be more disciplined, the Kegels for me are for bladder control."  
"Yes I haven't had any leaking of urine."  
"Yes it did help bladder wise."  
"Yes, helped with bladder control"  
"Yes, they strengthen pelvic floor muscles and decrease leakage."  
"Yes, I did not have any bladder control problems during or after pregnancy."  
"Yes, to tighten the vaginal walls back up"  
"Yes, helped with pushing during labor"  
"Yes, got me ready for delivery. I healed quicker and was back on my feet in no time."  
"Yes, healthy in shape"  
"Yes, it relieved pressure."  
"No, they don't seem to help control bladder function to any great degree"  
"I haven't done them enough to give a good answer"  
"Could have been"  
"I don't know- first pregnancy"  
"I didn't do them enough to benefit from them"  
"Not sure since I don't do them regularly"  
"I guess but not really sure because I don't know what it would have been like if I didn't do them."  
"I think so."  
"Couldn't tell"

**6) Other Comments Regarding Various Aspects of Survey:**

**a) Regarding Information received:**

"Staff figured I knew it (information) already. I think it is good to be reminded though."

"Correct lifting techniques already learned through work."

"Information received (How hard/ How often, PF, Breathing techniques, Physical changes) from yoga video"

"Was given brochure when mentioned PF problems to doctor (with no coaching)."

"I have never heard about it (scar massage). I wish I knew about it."

"All information (breathing techniques) from prenatal class. My instructor was great."

"Information from MD (but only because I asked)."

"Never heard of it (scar massage)"

**b) Regarding Exercise During Pregnancy:**

"Only exercise periodically (don't have enough time now)"

"Running (5x's/wk) in the first few months"

"On bed rest"

**c) Do you Perform Pelvic Floor Exercises?**

"No but I should I suppose even though I had a c-section."

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## *Handout for Pelvic Floor Exercises*

### **Exercise #1: The Stop Test**

(Note: Advise women not to do this first thing in the morning and to do only once a week as a test only. Women with incontinence may have difficulty contracting the pelvic floor muscles in a gravity-resisted position.)

*Position:* Sit on the toilet. Spread legs apart for urination and support feet on a stool if voiding is difficult.

*Exercise:* As you urinate, stop and hold the flow of urine. Repeat a few times, breaking off the urine flow smoothly and completely. Try not to allow any dribbling of urine. Hold tightly for 5 seconds before starting urine flow.

*Progression:* Let smaller amounts of urine pass each time. Do not worry if this is difficult. Try to always end the voiding with an uplifting contraction of the pelvic floor.

### **Exercise # 2 Long Contractions**

*Position:* Lie on back or side with legs apart and chest relaxed.

*Exercise:* Draw pelvic floor upward. Feel the squeeze as the sphincters are tightened, and the inside passage becomes narrow and tense. Focus on the front portion of the pelvic floor where the master sphincter surrounds the vagina and the urethra. Initially, hold 10 seconds and then completely relax. Attempt to relax a little bit more, releasing any residual tension. Repeat 2 or 3 times, relaxing and repeating. Always end with a contraction.

*Progression:* Try other positions such a sitting, standing, and squatting. Do a total of 50 repetitions a day: 10 repetitions at a time, 5 sessions per day, holding each repetition for 10 seconds. Relax between each contraction.

### **Exercise # 3 Quick Contraction**

*Position:* Lie on back or side with legs apart and chest relaxed.

*Exercise:* Draw pelvic floor upward. Feel the squeeze as the sphincters are tightened, and the inside passage becomes narrow and tense. Focus on the front portion of the pelvic floor where the master sphincter surrounds the vagina and the urethra. Initially, hold 2-3 seconds and completely relax. Attempt to relax a little bit more, releasing any residual tension. Repeat 2 or 3 times, relaxing and repeating. Always end with a contraction.

*Progression:* Try other positions such a sitting, standing, and squatting. Do a total of 50 repetitions a day: 10 repetitions at a time, 5 sessions per day, holding each repetition for 3 seconds. Relax between each contraction.

### **Exercise # 4 The Elevator**

*Position:* Assume any position, although lying down is easier at first.

*Exercise:* Imagine your are in an elevator on the first floor. As you ascend to each floor, draw up the pelvic floor muscles a little bit more. When you reach your limit, do not let go, but descend floor by floor, gradually relaxing the pelvic floor in stages. When you have reached the first floor, think about releasing, and continue to the basement. Do not hold your breath, blow out through pursed lips. Feel the perineal muscles bulge. Complete this exercise by bringing the pelvic floor back up to the ground.

### **Exercise # 5 The Sexercise**

*Position:* Assume any position of coitus with the legs spread apart and relaxed.

*Exercise:* Grip the penis as firmly as you can with your vagina, holding for 5 seconds before you relax. Try to avoid tensing the buttocks and the abdominal muscles. Repeat a few times until your partner tells you the strength of the contractions has diminished. Rest and repeat in a few minutes.

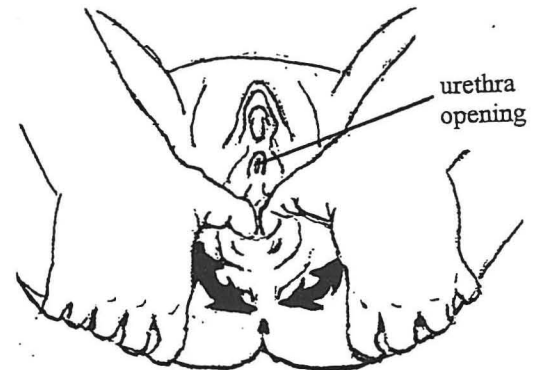
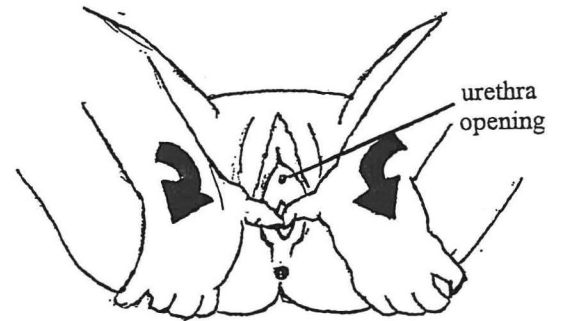
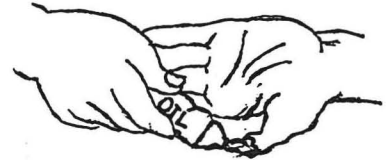
*Progression:* Your muscle strength will increase as you learn to make the contractions stronger, more consistent and more numerous.

[Adapted from Stephenson, G. *Obstetric and Gynecologic Care in Physical Therapy*: 124.<sup>7</sup>]

## Perineal Stretching Techniques

Massaging the perineum (skin around the vaginal opening) daily for the last 6 weeks of pregnancy may help avoid the need for an episiotomy and/or prevent tearing during delivery. This technique gradually stretches the vaginal and perineal tissues, rather than expecting them to respond to an intense stretch during delivery. It is also helpful to learn to strengthen and relax your pelvic floor muscles by doing Kegel (or pelvic floor) exercises throughout your pregnancy.

1. The massage should be done daily for 5-10 minutes, starting about six weeks before your due date (or 34 weeks gestation).
2. Make sure your bladder is empty and that you are propped up comfortably. A warm bath may help you relax and soften your perineum. Use a mirror the first few times until you become familiar with the area you are massaging.
3. Massage a natural oil (wheat germ oil, olive oil, or plain salad oil) into the tissues of the perineum and just inside the vagina. Pay special attention to any scar tissue from past episiotomies or tears.
4. Put your thumbs (or have your partner put both index fingers) about 2 inches into vagina and press downward toward the rectum. While maintaining gentle, steady pressure, the fingers should move upward along the sides of the vagina, in a rhythmic "U" movement. Avoid rubbing the urinary opening located directly above vagina.
5. As you massage each day, your tissues should relax and stretch. Gently stretch vaginal opening as wide as possible each session. You should feel a slight tingling or burning sensation, which will also mimic the feeling of the baby's head beginning to crown.
6. Hold this painfree stretch for 45-60 seconds and then release. Massage with more oil and repeat the stretch one more time.



## Post-Cesarean Exercise Program

### Day 1

1. Diaphragmatic breathing: mother splints incision with her hands or a splint pillow while performing deep breathing.
2. Mid-chest expansion: mother puts hands along the side of the lateral chest wall while directing air into lungs so that ribs expand into her hands.
3. Upper chest expansion: mother places one hand over the sternum, the thumb and fingers are over the clavicle, while she directs the chest expansion into her hand.
4. Huffing: mother splints incision and breathes in through the nose and on exhalation, she repeats a forced “Ahhhh.”
5. Pelvic floor exercises

### Day 2 and 3

All of the Day 1 exercises should be done plus:

1. Pelvic tilt: sidelying or sitting positions.
2. Leg slides: knees bent lying on back, pull stomach in, flatten back, slide one leg up and down, maintaining pelvic control. Do not extend legs down fully.
3. Hula: lying supine, legs flat; hike hip up and down.

### Day 4 and 5

If mother is up and about easily, discontinue breathing exercises.

1. Check for diastasis recti abdominis and do corrective exercises, if needed; mother crisscrosses hands across abdomen, approximating the rectus abdominis and lifts head up.
2. Partial lower trunk rotation: on back, knees bent, shoulders flat, knees drop together from side to side, head turns in opposite direction of the knees.

### Day 6

Do all exercises as previously listed, plus:

1. Pelvic tilt: on all fours, then gradually add more challenging abdominal exercises, including the oblique muscles.

[Adapted from Frahm J: Hutzell Hospital Physical Therapy Department. Post-Cesarean Exercise Program.<sup>82</sup>]

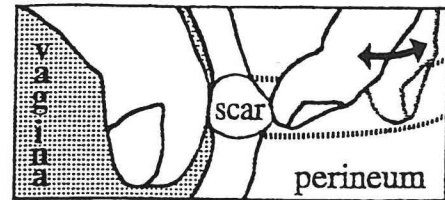
## How To Massage

Within five to ten days the stitches will dissolve. Once this happens, you can begin to massage the tissues between the vagina and anus. Insert your thumb into your vagina while keeping the index finger over the perineal body above the scar. Gently roll the tissue between thumb and finger. Use a warm compress to get started. This will relax the muscles and allow you to touch yourself with less discomfort.

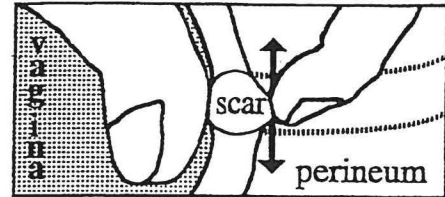
**TIP: Scar tissue? Anus? Vagina? Stick your thumb in? If you find this embarrassing, read it twice! The muscles in this region are crucial to your health and well being . They support your internal organs, play a role in sexual function, and maintain continence of both bladder and bowel. Learn to touch, look at, move, and think about this part of your body. It will help you heal faster and stay healthier.**

**You can massage the scar tissue from an episiotomy or tear in three directions.**

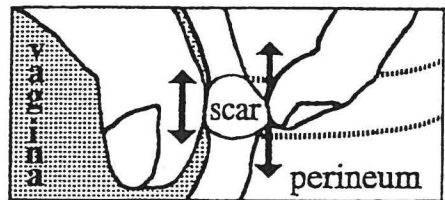
With the grain (working along the line of the scar).



Against the grain (working across the scar).



By rolling the scar between the thumb and forefinger.



As the scar is massaged it will become smaller, more elastic, and less tender. This permits the tissues of the muscles to regain their function without getting stuck to one another and it reduces the interference of thick masses of scar tissue.

If scar tissue has adhered and is causing discomfort during intercourse, you should have a medical practitioner, either an ob/gyn, a midwife, or a physical therapist specializing in women's health, evaluate your condition. They will help you learn self-massage and will be able to apply deep heating ultrasound to the affected area. (This is not the same ultrasound used to view your baby inside you.) Four or five ultrasound treatments coupled with massage will often make the scarred area painless to the touch and intercourse less uncomfortable.

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## Scar Mobilization

An incision long enough to accommodate your baby leaves a long scar. Even if the scar is low on your belly and scarcely visible, it could use some attention from you. Scar mobilization means just what it sounds like, moving the scar tissue around using simple massage techniques.

### Why Do It?

Once your incision is healed, it's important to prevent the scar tissue from adhering to the muscle layers deeper inside. Remember that your incision penetrated all the way through skin, muscles, and uterus. Scar tissue can be quite deep.

### When To Begin

You can begin to lightly massage your scar as soon as the incision has healed and the staples or stitches are out. Be gentle when you first begin, and if you feel any discomfort, stop and be much gentler. Your eventual goal is to move the skin and the muscles underneath so that they seem to slide freely over one another.

In most cases scar tissue and its tendency to adhere to muscle, can be dealt with by you. Your scar can be lifted and separated from healthy muscle tissue to reduce or eliminate adhesion. This scar mobilization will actually reduce the amount of scar tissue. As you loosen the scar, it may also take away any feelings that you have of pinching or pulling your lower belly as you reach for things on a high shelf.

There is no final time limit for working on scars. You can begin two years after a cesarean or episiotomy and still make the scar softer, thinner, and less visible.

### How To Do It

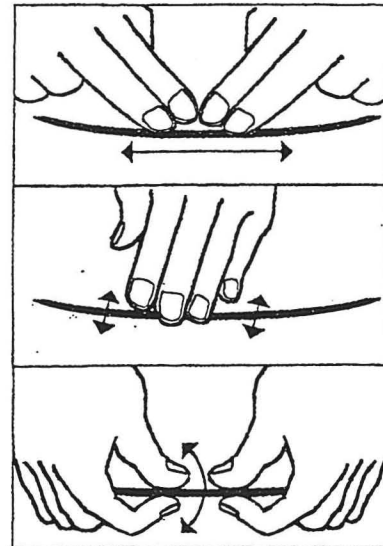
Some people are reluctant to touch the scar or even the whole general area of the incision. If you feel this way, begin by lightly touching and stroking yourself, first with your palms and then with your fingertips. If this is too hard, begin by using a soft, clean cloth. Use a mirror to closely examine your scar. Nobody is going to be gentler or more thoughtful about your healing than you yourself.

Begin scar mobilization by rubbing your hands together to warm them up. You can use warm compresses or neutral oils, if they make you more comfortable or make the massage pleasanter, but they aren't necessary. If oil appeals to you, use a little, but don't make the skin so slippery that you can't get a good hold on the scar tissue.

Massage the scar tissue by working it with a rubbing motion along the grain (along the line of the scar).

Stroke back and forth against the grain (across the scar).

Roll the scar between your thumb and your forefinger.



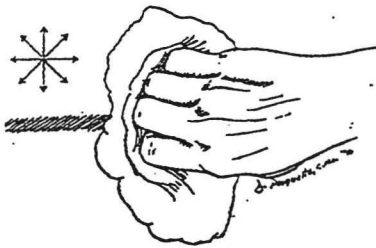
To get the maximum benefit, the massage should be done 2-3 times a day for 5-10 minutes at a time. The more you massage the scar, the more pliable, soft, thin, and cosmetically appealing it will become. Don't rub so hard that it hurts. At the end, hold the ends of the scar. Gently push and pull it back and forth and from side to side for a minute or two. You can expect to feel and see results in three to four weeks. Don't worry about not always doing the full time, every little bit will help.

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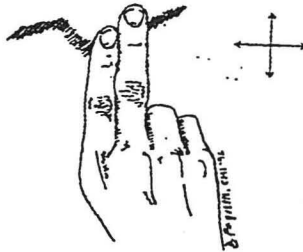
## Scar Massage after Abdominal Surgery

Begin scar massage as soon as possible after surgery. When the scab has fallen off and there is no seepage from the scar (at least two weeks), you may begin with step 1. The benefit is greatest when the skin is worked just below the pain threshold as firmly as possible. However, it is very important to start gently and progress slowly to deeper and stronger massage. You should never feel sharp stabbing pain. A strong pulling sensation or a light burning is okay. We recommend 5-15 minutes per day. Some people find that after showering or bathing is a more comfortable time to perform scar massage. Do not slide across the skin. Do not use lotion or oil.

### 1. Scar Desensitization



### 2. Push and Pull



### 3. Skin Rolling



### 4. Plucking



1. Scar Desensitization: Use a rough wet towel to rub across the scar in all directions. Repeat with a dry towel if tolerated. This will help to decrease the sensitivity of the scar and help you feel more at ease touching it.

2. Push and Pull: Place two fingers directly on the scar and move it slowly straight toward the ribs. When the skin stops moving, continue to help firm pressure on the scar for 1 to 2 minutes. This should produce a strong pulling sensation, but should not cause sharp pain. Repeat to down to pubic bone, to right, and to left in a similar manner. You may notice one or two directions that feel especially "stuck." Spend a little more time holding in those directions.

3. Skin Rolling: Pinch the skin on either side of the scar, lifting the skin up. Start at either end and move forward and backward, rolling and raising the skin as you move. A free scar bulges upward. A stuck scar dimples inward. Try this 2-4 weeks after surgery.

4. Plucking: Put your index finger on one side and the thumb on the other side of the scar. Attempt to pick up the scar, separating it from the underlying tissue. If you can get under the scar, move your fingers slightly from side to side for 1-2 minutes. Start at either end and work toward the center. If the skin slips out of your fingers, you may not be ready for this stage, but keep trying. Begin this 4-8 weeks after surgery.

Adapted from: Wilder E. The Gynecological Manual: American Physical Therapy Association:280-281.<sup>8</sup>

## American College of Obstetricians and Gynecologists (ACOG) Recommendations for Exercise in Pregnancy and Postpartum

- During pregnancy, women can continue to exercise and derive health benefits even from mild to moderate exercise routines. Regular exercise (at least 3 times per week) is preferable to intermittent activity.
- Women should avoid exercise in the supine position after the first trimester. Such a position is associated with decreased cardiac output in most pregnant women. Because the remaining cardiac output will be preferentially distributed away from splanchnic beds (including the uterus) during vigorous exercise, such regimens are best avoided during pregnancy. Prolonged periods of motionless standing should also be avoided.
- Women should be aware of the decreased oxygen available for aerobic exercise during pregnancy. They should be encouraged to modify the intensity of their exercise according to maternal symptoms. Pregnant women should stop exercising when fatigued and not exercise to exhaustion. Weight-bearing exercises may under some circumstances be continued at intensities similar to those prior to pregnancy throughout pregnancy. Non-weight bearing exercises, such as cycling or swimming, will minimize the risk of injury and facilitate the continuation of exercise during pregnancy.
- Morphologic changes in pregnancy should serve as a relative contraindication to types of exercise in which loss of balance could be detrimental to maternal and fetal well-being, especially in the third trimester. Further, any type of exercise involving the potential for even mild abdominal trauma should be avoided.
- Pregnancy requires an additional 300 kcal/day to maintain metabolic homeostasis. Thus, women who exercise during pregnancy should be particularly careful to ensure an adequate diet.
- Pregnant women who exercise in the first trimester should augment heat dissipation by ensuring adequate hydration, appropriate clothing, and optimal environmental surroundings during exercise.
- Many of the physiologic and morphologic changes of pregnancy persist 4 to 6 weeks postpartum. Thus, prepregnancy exercise routines should be resumed gradually based on a woman's physical capability.

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