Pelvic Floor Muscle Training in Management of Postpartum Pelvic Floor Dysfunctions: A Literature Review

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PELVIC FLOOR MUSCLE TRAINING IN MANAGEMENT OF POSTPARTUM PELVIC FLOOR DYSFUNCTIONS: A LITERATURE REVIEW

by

REBECCA S. TANNER

A thesis submitted in partial fulfillment of the requirements for the Honors in the Major Program in Health Sciences Pre-Clinical in the College of Health and Public Affairs and in The Burnett Honors College at the University of Central Florida Orlando, Florida

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Thesis Chair: Dr. Carey Rothschild
Abstract

Women can face a wide range of pelvic floor dysfunctions following pregnancy, ranging from urinary incontinence to pelvic pain. Unfortunately, these problems are not routinely checked for in postpartum check-ups and women do not always bring it to the physician’s attention. Strengthening of the pelvic floor muscles may be able to help women prevent these disorders and improve these women’s lifestyles.

The purpose of this thesis was to review and analyze different trials to determine if different pelvic floor dysfunctions (urinary incontinence, sexual dysfunction, and pelvic girdle pain) can be treated using pelvic floor muscle training in the postpartum. After reviewing the literature, it was determined that Pelvic floor muscle training may be effective in treating Urinary incontinence, but there is a lack of research to state that it helps treat sexual dysfunction and pelvic pain. Pelvic floor muscle training is a conservative non-invasive treatment and very simple for women to do on their own, therefore more research should be performed to see if this can be a simple fix to a plethora of problems women face in the postpartum.
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Background

The number of births in the United States have trended upward in recent years; in 2015, 4 million births were reported, and 37% of these women encountered some kind of pelvic floor dysfunction following delivery.\textsuperscript{1,2} Of these dysfunctions urinary incontinence has a prevalence rate of 33%, sexual dysfunction has a rate of 71%, and pelvic pain occurs between 16% and 25% in the postpartum.\textsuperscript{3-5} A variety of treatments are available to treat these conditions including pelvic floor muscle training (PFMT).

PFMT aims to restore the neuromuscular control and strength of the muscles in the pelvic floor so that they can aid in supporting the organs and structures involved in the common dysfunctions. PFMT consists of repetitions of contraction and relaxations of the muscles in the pelvic region.\textsuperscript{6}

Anatomy and Function of the Pelvic Floor

The pelvic floor is a complex integrated collection of innervated ligaments, muscles and extracellular matrix found in both males and females. Its primary role is to provide support to the pelvic organs and to protect the bladder, urethra, reproductive organs, and the rectum.\textsuperscript{7} Three orifices weaken the pelvic floor in females: the vagina, the urethra and the anus. Therefore, the musculature and ligamentous structures in this area must be strong and supportive to prevent pelvic floor disorders.\textsuperscript{7,8} This region is composed of six layers of tissue: the pelvic peritoneum, the visceral layer of pelvic fascia, the deep muscles, the superficial...
muscles, and the subcutaneous fat and skin. Both the superficial and deep layers of muscles play an important role in providing hammock-like support to the pelvic organs.

The superficial layer consists of five structures: transverse perineal muscle, bulbocavernosus muscle, ischoocavernosus muscle, external anal sphincter, and the membranous sphincter of the urethra. The strength of these muscles maintain the pelvic floor structure and directly support the urethral, vaginal and anal sphincters. The deep muscles of the pelvic floor are commonly known as the levator ani muscles. Strength in these muscles provides the primary support of the pelvic region. The levator ani consists of three different muscles: the pubococcygeus, the iliococcygeus and the ishiococcygeus. The levator ani and coccygeus muscles orginate on the inner surface of the side of the lesser pelvis and insert into the inner surface of the coccyx bone. This cross sectioning of the muscles across the inner pelvis allows for the hammock like support to the inner organs. A critical function of the muscles is to provide stabilization when there is an increase in intra-abdominal pressure caused by vomiting, coughing, urination, and defecation. The deep muscles indirectly support the uterus, directly support the vagina, and play a vital role in childbirth.

**Risk Factors for Pelvic Floor Dysfunction**

Decreased muscular strength in the pelvic floor muscles can lead to dysfunctions including incontinence, pelvic pain and sexual dysfunction. Estimates suggest that 24% of the female population in U.S may suffer from some form of pelvic floor dysfunction. Risk factors for such conditions include age, increased body weight, smoking, pregnancy, and childbirth.
Age is a contributing factor for conditions of pelvic floor dysfunction. Thirty-nine percent of women between the ages of 60-79 years have some type of pelvic floor dysfunction, and this rate increases to 50% in women 80 years or older. With normal aging the pelvic floor muscles become weakened and overstretched, which may cause it to be insufficiently able to support the structure and organs of the pelvis. Hence, rates of incontinence and pelvic organ prolapse are likely to increase.

An increase in body weight and obesity can have adverse effects on a women’s health. The increase in intra-abdominal pressure can put strain on the connective tissue and muscles of the pelvic floor causing pelvic floor dysfunctions. It has been found that morbidly obese women have an increased risk for urinary incontinence and pelvic organ prolapse.

Another contributing factor that raises the risk of pelvic floor dysfunction is smoking. Coughing associated with inhaled tobacco use increases the intra-abdominal pressure and can damage the pelvic floor by weakening the collagen of the pelvic floor tissues. Smoking also causes irritation to the bladder endothelium by causing inflammation to the bladder wall. Hojberg et al found that women who smoked during pregnancy had a 6.8% greater chance of urinary incontinence.

Pregnancy and childbirth are also significant contributors to pelvic floor dysfunction as they often lead to a considerable reduction in pelvic floor muscle strength. This reduction of strength may be the cause of pelvic girdle pain, sexual dysfunction and urinary incontinence. Studies have shown that pelvic floor muscle training (PFMT) during pregnancy and the
The pelvic floor muscles can improve the strength of the pelvic floor musculature and possibly prevent and manage such symptoms.\textsuperscript{19-22}

**The Pelvic Floor During Pregnancy**

During pregnancy, a considerable amount of stress is placed on a woman’s pelvic floor musculature and supportive structures. The pelvic region must support the weight of the baby (or babies in the event of multiples) as well as the placenta and amniotic fluid.\textsuperscript{7} The increasing weight further causes a rise in the intra-abdominal pressure, which, in turn leads to a weakening and stretching of the pelvic floor muscles.\textsuperscript{3}

Pregnancy hormones may also contribute to laxity of the pelvic floor muscles. Progesterone and relaxin hormones cause a softening of the ligaments and muscles in the pelvic region, by allowing remodeling and stretching of the area in preparation for the passage of the baby through the birth canal.\textsuperscript{8} Excessive stretching of the muscles and ligaments in the pelvic region can cause nerve injury. Consequently, muscles of the pelvic floor may be affected. Injury to the pudendal nerve may result in partial denervation to the pelvic floor musculature and subsequent muscular weakness ultimately leading to the development of stress urinary incontinence and pelvic organ prolapse.\textsuperscript{8,23}

As pregnancy progresses the fetus starts to descend, which increases the amount of pressure placed on other organs in the pelvic region. It is common for pregnant women to report increased urinary urgency as a result of the bladder having less room to expand and accumulate urine.\textsuperscript{24} Pregnancy can also potentially push the bladder forward causing an
increase in the angle between the bladder neck and the urethra which may lead to urinary incontinence.\textsuperscript{24,25}

**The Pelvic Floor During Childbirth**

The effects of childbirth on the pelvic floor depend on the type of delivery, either vaginal or Cesarean (C-section). During vaginal delivery the baby must pass through the pelvic floor which causes stretching of the nerves, blood vessels, muscles and ligaments in this area.\textsuperscript{7} Sigurdardottir et al showed that in vaginal delivery, pelvic floor muscle strength was decreased considerably compared to antepartum. During the second stage of labor the levator ani muscle undergoes significant strain which leads to stretching and potential damage of the muscles.\textsuperscript{7} Estimates suggest that 13-36\% of women who deliver vaginally may experience some type of levator ani muscle injuries.\textsuperscript{26} The levator hiatus, the most prevalent hernia opening in the body, also distends remarkably to enable an infant to pass through the birth canal.\textsuperscript{27} This expansion can cause the surrounding levator ani muscles to reach their elastic limit, potentially causing permanent injury.\textsuperscript{28}

Muscle strength is greatly influenced by mode of delivery; while pelvic floor muscle strength decreases more in women who deliver vaginally.\textsuperscript{18} Hiatal sizes are also seen to be larger in women who deliver vaginally, this difference in hiatal dimensions between vaginal and C-section deliveries may be caused by the increased occurrence of levator ani avulsions during vaginal delivery. Studies have shown a correlation between the number of avulsions to the increased hiatal dimensions post-vaginal delivery.\textsuperscript{29}
Women with these avulsions are at risk for a reduction of pelvic floor muscle strength which may be a leading cause of pelvic floor disorder. Instrument-assisted deliveries may further increase the chances of some dysfunctions. The use of forceps during delivery can increase the rate of levator ani muscle damage as much as 35-64%. The greater the levator ani muscle trauma, the more likely of pelvic floor dysfunction. Other risk factors leading to pelvic floor impairments during delivery include delayed childbearing, large head circumference, prolonged second stage of labor, pushing during the second stage of labor and increased age of the mother during pregnancy.

**Background of Pelvic Floor Disorders**

**Urinary Incontinence**

Urinary incontinence (UI) is the most prevalent pelvic floor dysfunction seen in women. Estimates suggest that urinary incontinence affects between 32% and 64% of all women and a 33% prevalence rate during the first three months of the postpartum period. UI is defined as “any complaint of involuntary leakage of urine”. There are three main types of UI: Stress urinary incontinence (SUI), urgency UI and mixed UI. SUI is defined as the “involuntary leakage on effort or exertion or on sneezing or coughing.” Urgency UI is the “involuntary leakage accompanied by or immediately proceeded by urgency”. Mixed UI is the “involuntary leakage associated with urgency, as well as urgency with exertion, effort, sneezing and coughing”. SUI is the most common type of UI in women, followed by urgency UI.
SUI is likely caused by the lack of muscle strength in the sphincters and the supportive structures in the pelvic floor muscles and tissue. Athletic participation in sports such as gymnastics may place further demand on the pelvic support system; 80% of gymnasts may suffer from SUI. Gymnast landing on a balancing beam or on the uneven bars can cause increase in intra-abdominal pressure, causing direct trauma on the urethral sphincter and the supporting pelvic floor. This can further cause Intrinsic urethral sphincter deficiency resulting in UI. Stress and urge urinary incontinence are also more likely in women who are elite athletes. Poswiata found that 50% of the elite athletes, such as cross country skiers and runners, were losing urine, either urge UI or SUI associated with coughing and sneezing.

UI may increase in women during pregnancy and childbirth. Bozkurt reported 65% of women stated a first occurrence of UI either during pregnancy or in the postpartum period. There is also a higher rate of UI in women who have had levator ani muscle avulsions during childbirth. Another risk factor contributing to UI is the mode of delivery. Women who deliver via a C-section may have a lesser occurrence of incontinence. Risk factors during pregnancy that contribute to UI are excessive weight gain, family history of UI and women of older age.

There are several treatments available for UI. To treat stress urinary incontinence women can perform PFMT, electric and magnetic stimulation or take medication such as topical estrogen. To treat urgency UI, timed or scheduled voiding, often referred as bladder drills, are recommended to increase bladder capacity. Doing percutaneous tibial nerve stimulation is effective in improving UI and treating an overactive bladder by preventing bladder contractions.
contractions.\textsuperscript{39} Taking medications such as Tolterodine also helps prevent UI by blocking acetylcholine in the muscles of the bladder. Blocking acetylcholine reduces the urge to urinate and slows the pressure build up in the bladder. It is still unknown if Tolterodine is found in breast milk and therefore women should contact their doctor before taking.\textsuperscript{40} \textsuperscript{38} In more extreme cases surgical treatments are available.\textsuperscript{41}

**Pelvic Girdle Pain**

Lumbopelvic pain is a common issue for women during pregnancy. Pelvic girdle pain (PGP) is prevalent in 20\% of all women but increases to 50\% with pregnancy.\textsuperscript{36} \textsuperscript{42} Some studies suggest that PGP is a form of lower back pain, but PGP can occur independently of lower back pain.\textsuperscript{36} There are four categories of PGP depending on the location of the pain: pelvic girdle syndromes (anterior and posterior of pelvic girdle), symphysis (anterior pelvic girdle and pubic symphysis), one-sided sacroiliac syndrome (posterior pelvic girdle and unilateral sacroiliac joints), and double-sided sacroiliac syndrome (posterior girdle and bilateral sacroiliac joints).\textsuperscript{4,43} The location of PGP is commonly reported in the area between the gluteal fold and the posterior iliac crest, and can promulgate to the posterior thigh.\textsuperscript{36}

The exact cause of pelvic girdle pain is still unknown, but the location of the pain has a correlation with how long the pain persists.\textsuperscript{44} Studies suggest that if PGP occurs in conjunction with lower back pain during pregnancy, PGP can persist up to 3 months postpartum. Women who have fewer pain locations during pregnancy are less likely to have PGP that persists in the postpartum period.\textsuperscript{45} Mode of delivery also influences PGP, women who deliver vaginally may
have a lesser chance of pelvic girdle pain postpartum.\textsuperscript{12,36} When pelvic pain persists after pregnancy and is prolonged after childbirth a woman’s ability to function in daily activities may be significantly reduced.\textsuperscript{42}

**Sexual Dysfunction**

Sexual dysfunction can be defined as the “disordered desire, arousal, orgasm, or pain and distress” experienced by women during intercourse, which has been found to increase in women following childbirth.\textsuperscript{24,46} Dissatisfaction can be due to decreased arousal related to sleep deprivation, anxiety, postpartum depression and even pain during intercourse.\textsuperscript{24} Dyspareunia and the loss of desire are typically short-term postpartum sexual changes and are common in postpartum women, occurring at rates of 22% and 86% respectively.\textsuperscript{20} Studies have reported that the pelvic floor muscles play a major role in a women’s sexual function and orgasmic potential. The muscles have a role in the voluntary rhythmic contractions in receptivity and motor responses during orgasm.\textsuperscript{20} Without the proper functioning of these muscles women may develop these sexual dysfunctions.

Studies have shown a correlation between an increased occurrence of sexual dysfunction and an increased rate of avulsion in the levator ani muscle.\textsuperscript{9} Levator ani muscle avulsion may result in reduced vaginal sensation following childbirth. Women who have had less severe avulsions during childbirth were able to resume sexual intercourse within 3 months after delivery.\textsuperscript{30} Hence, the pelvic floor muscle plays a very important role when it comes to female sexual function.
Risk factors associated with sexual dysfunction include the mode of delivery (vaginal delivery has a greater risk), perineum tears, or maternal fatigue. Vaginal dryness related to breastfeeding is due to decreased estrogen levels and can be treated with lubricants. Sexual dysfunction can also be caused by the lack of desire leading to decreased arousal, and aberrant sexual response cycle. Having a baby can be overwhelming and time-consuming causing women to have a decreased sexual desire.

There is a lack of research on treating sexual dysfunction in the postpartum period, but treatments that are being used are pelvic muscle contractions, vaginal lubricants and communication with one’s partner to make time for sexual activity.

**Screening of Pelvic Floor Disorders in the Postpartum Female**

Even though pelvic floor disorders are commonly seen in women after pregnancy, screening and evaluation is not universal. Some providers may ask women in their postpartum checkup how they are doing but not ask specifically of such disorders. Unless the patient brings up the issues herself, the provider may be unaware of such problems.

A routine postpartum examination includes a screen for mental and physical well-being, assessment of breast feeding, evaluation of any surgical incisions, and a pelvic exam if indicated to assess the perineum for healing. If women do report pelvic floor dysfunctions to their provider, pelvic floor rehabilitation may be recommended. This therapy consists of stretches and contractions of the pelvic floor muscles to regain pelvic floor strength.
**Pelvic Floor Muscle Training**

PFMT is a program taught or supervised most commonly by a physical therapist and consists of the relaxation and contraction of the muscles of the pelvic region.\(^6\) The objective of PFMT is to strengthen the muscles of the pelvic region to help prevent/treat pelvic floor dysfunctions. A common way to perform PFMT is to hold a contraction for 10 seconds followed by the relaxation for another 10 seconds, repeated 10 times 3-5 times a day, also known as a Kegel.\(^53\)

PFMT is commonly used to increase the strength of the pelvic floor to help improve symptoms such as UI. The purpose of this literature review is to determine if PFMT is effective in treating UI, Pelvic girdle pain and sexual dysfunction in the postpartum period.
Methods

Data Sources

Searching specific databases, (MEDLINE-EBSCOhost, CINAHL Plus full text, and SPORTDiscu) while implementing an inclusion and exclusion criteria was performed to examine PMFT muscle training on postpartum women to manage pelvic floor disorders. This review and analysis of literature completed between September of 2015 to November of 2015. The keywords used were pelvic floor muscle training or PFMT in combination with urinary incontinence, stress urinary incontinence, pelvic pain, pelvic girdle pain, and sexual dysfunction. The studies were also restricted to have the requirements of being written in English.

Study Selection

Originally the studies that were chosen had pelvic floor muscle training/PFMT in combination with the keywords stated in the title or abstract. A meeting between two reviewers was held to further include or exclude articles. During this time articles were excluded if PMFT was not done in the postpartum period. Exclusion keywords included antepartum, antenatal and prenatal. The two reviewers agreed on the articles to be used for the quality assessment (APPENDIX A).

Quality Assessment

The Downs and Black checklist was used to check the methodological quality of the articles. The checklist provides an overall score value in assessing the quality of the article based on four categories of assessment: reporting, external validity, internal validity-bias, and
internal validity-confounding. The maximum score a study can receive is 26; the higher the score an article received the better the quality of the study. The Downs and Black checklist has been found to have a high internal consistency (KR-20: .89) for both randomized and non-randomized studies, a high test-retest reliability (r=.88), a good inter-rater reliability (r=.75) and a high quality index score (.90)(APPENDIX B). Using the overall score of each article they were further categorized from conflicting evidence to strong evidence using Van Tulder’s level of evidence table (APPENDIX C).
Results

Fifteen articles were obtained using the exclusion and inclusion criteria. The dispersion of articles by condition were as follows: ten urinary incontinence, three pelvic girdle pain, and two sexual dysfunction.

Quality Assessment

After analyzing each article with the Downs and Black checklist there was an average score of 17.26 with a range from 14 points to 20 points. The average score for the urinary incontinence articles was 17.60 points, while the pelvic girdle pain articles averaged 16.67 points and the two sexual dysfunction articles averaged 16.50 points.
Discussion

Urinary Incontinence

There is strong evidence that PFMT improves UI in postpartum women. Based on the ten articles that were reviewed, 8 found that PFMT resulted in improved UI symptoms. Meyer’s study, which had a follow up period of 10 months, saw a 19% improvement in the PFMT group compared to a 2% improvement in the control group. Sut’s study investigated PFMT in improving pelvic floor muscle strength and UI symptoms. The results indicated a correlation between an increase in pelvic floor strength and an increase in the quality of the women’s life. A seven year follow up was performed in Dumoulin’s study which also saw improvement in UI, but it was not as pronounced immediately after the training. Thus, PFMT may be considered useful in managing UI symptoms in both the short and long-term periods following childbirth.

Based on the 8 articles that support PFMT, specific pelvic floor muscle contraction routines help reduce UI in postpartum women. Multiple studies performed a maximum contraction and held this contraction for 6-8 seconds followed by 10 fast contractions. The women would than repeat this 10 times daily. However, in Kim’s study the subjects did the exact same exercise but in various positions (supine, prone, sitting and standing). Kim and Marques paired the use of contractions with the inclusion of other exercises to try to improve pelvic floor muscle strength. The exercises included abdominal strengthening and trunk stabilizing exercises. While each of these methods improved UI, alternating pelvic floor contractions seems to be necessary to prevent UI.
Two studies did not find improvement in UI with the use of PFMT. Hilde et al had a follow up period of 6 months and subjects performed weekly supervised sessions for 16 weeks but did not see any significant improvements.\textsuperscript{62} This article had the lowest score on the Downs and Black checklist compared to the other UI studies; the internal validity of the selection bias was scored low. The lack of choosing an appropriate assessment for this study could have contributed to the different results from the other studies. Glazener performed two studies investigating PFMT on UI, one in 2001 and the other in 2013. The first assessed participants at one year post-delivery, while the second used the same participants but at a 12 year follow up. After one year there were significant improvement in UI symptoms compared to the control (60\% vs 69\%), however, after 12 years there was little to no improvement (80\% vs 83\%).\textsuperscript{60,63} This may be due to 92\% of the women had at least one more child following the initial study and if the women did not continue PFMT, the pelvic floor muscles would not regain its strength.\textsuperscript{63}

**Sexual Dysfunction**

Limited evidence supports the use of PFMT in treating sexual dysfunction in postpartum women. Citak’s study scored a total of 18 points on the Downs and Black checklist, indicating moderate quality; the lowest section being external validity. This study did an inadequate job of representing an entire population by taking a low number of 75 volunteers from one hospital instead of randomly choosing women from different areas. If more volunteers were chosen it may have been a more adequate depiction of the population. The result of this study showed
that PFMT had a positive effect on improving female sexual function by the seventh month postpartum. Arousal, lubrication and orgasm scores all seemed to improve compared to the control group, who did not receive PFMT treatment.\textsuperscript{20} However, due to the poor quality of the study, these positive findings must be interpreted cautiously.

Gagnon found that using PFMT during the postpartum resulted in an increase in pelvic floor function but sexual function was found to be inconclusive. This may be attributed to the fact that many women had not yet resumed sexual activity since childbirth.\textsuperscript{64} Hence, the three-month follow up was an insufficient time period to deduce whether or not PFMT is effective in treating sexual dysfunction.

**Pain**

There is limited evidence on the treatment of pelvic girdle pain with PFMT in postpartum women. Sleep et al and Stuge et al both found an improvement in pelvic girdle pain with the use of PFMT, while Gutke et al found no difference between the PFMT treatment group and control group.

Sleep’s randomized control study received a fairly low score of a 14 on the Downs and Black checklist, scoring the least amount of points in the reporting section. Sleep did not clearly describe the characteristics of the patient and did not describe the intervention being used. The study also did not describe the characteristics of the patients whom were lost to follow up, and failed to measure the consequence of adverse events that may have changed the results. This lead to a score of 0 for questions 3, 4, 8, and 9 in the reporting section. This study had women
perform specific stabilizing exercises as often as they can remember while doing daily tasks such as chores, showering and using the bathroom. Because this study was subjective to whether or not these women remembered to perform the exercises it was hard to record actual compliance to the treatment. Stuge’s study received a high score of 20 on the Downs and Black checklist and saw improvement in the exercise group in regards to pain in postpartum women. Compared to Sleep’s study there was a higher compliance with the exercise program by having supervised therapy sessions 3 days a week. Thus, supervised PFMT may lead to better outcomes in improving pelvic girdle pain.

Gutke et al did not find a difference in the treatment and control group in regards of improvement in pain. This may have been due to the fact that it was the responsibility of the subjects to perform the exercises. The subjects did have to record a daily journal to help with compliance to the program but the women can easily say they performed the treatment when they actually did not, also known as recall bias.
Conclusion

It is evident that women can undergo substantial damage to their pelvic floor muscles during pregnancy and childbirth, which can cause multiple dysfunctions in the postpartum period. PFMT seems to be effective in treating UI, but there is a lack of research to state that PFMT helps treat sexual dysfunction and pelvic pain. These studies have shown that the most effective way to treat UI with PFMT is to have women perform daily contractions of their pelvic floor muscles. She should first hold the contraction followed by a repetition of 10 fast contractions.

Overall, PFMT is a conservative and non-invasive treatment to help women treat certain dysfunctions. It is not only easy to teach, but is inexpensive compared to more invasive treatments such as surgery. Although research shows PFMT to be an effective treatment for UI further research investigating the use of PFMT for managing sexual dysfunction and/or pelvic pain is warranted.
Appendix A: Summary of Studies
<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Subjects</th>
<th>Dysfunction Category</th>
<th>PFMT Exercise Protocol</th>
<th>Outcome measures used</th>
<th>Pertinent findings</th>
<th>Quality (Was the study a Randomized Control trial?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahlund, Susanne, 2013</td>
<td>82 women</td>
<td>UI</td>
<td>PFM exercises performed 7 days a week for 6 months, midwife would visit every 6 weeks to encourage intervention</td>
<td>Bristol female lower urinary tract symptoms questionnaire to measure strength of pelvic floor and UI symptoms. Contraction measured with perionometer</td>
<td>PFMT is effective for UI. Written training and home-based training had same effect.</td>
<td>Yes</td>
</tr>
<tr>
<td>Citak, Nevin, 2010</td>
<td>75 women</td>
<td>Sexual Function</td>
<td>Instructed PFMT by nurse, booklet description of PFMT, told to do 10 second duration of contraction 10xs for 15 days</td>
<td>PFM strength with oxford grading system with an inflatable intravaginal device attached to a manometer, Intravaginal pressures measured</td>
<td>Scores of sexual desire and pain improved at the 7th month. Arousal, lubrication, orgasm and total scores of FSFI were higher in the PFMT group</td>
<td>Yes</td>
</tr>
<tr>
<td>Dumoulin, Chantale, 2013</td>
<td>57 women</td>
<td>UI</td>
<td>15 min of electrical stimulation than 25 min of PFMT, 10 min of deep abdominal muscle exercises, once a day, 5 days a week for 8 weeks</td>
<td>Pad test for urinary incontinence, 3 questionnaires assessment on the symptoms associated with UI</td>
<td>Deep abdominal training does not appear to further improve the outcome of PMFT, but PFMT does</td>
<td>Yes</td>
</tr>
<tr>
<td>Authors</td>
<td>Sample Size</td>
<td>Group</td>
<td>Intervention Details</td>
<td>Outcome Measures</td>
<td>Findings</td>
<td></td>
</tr>
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<tr>
<td>Gagnon, Louise-Helene, 2015</td>
<td>50 women</td>
<td>Sexual Function</td>
<td>4 sessions, performed PFMT with direct feedback</td>
<td>PF function measured by PFIQ-7 and PISQ-12, PF strength by the MOS, satisfaction with 10-point Likert scale</td>
<td>Improve UI</td>
<td></td>
</tr>
<tr>
<td>Glazener, Catheryn, 2001</td>
<td>747 women</td>
<td>UI</td>
<td>Assessment by nurses of UI with advice on PFM exercises at 5, 7 and 9 months postpartum.</td>
<td>Questionnaires regarding UI</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Glazener, CMA, 2013</td>
<td>471 women</td>
<td>UI</td>
<td>One-to-one instruction in PFMT with bladder training on 3 occasions</td>
<td>Questionnaire on fecal and urinary incontinence symptoms</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Gutke, Annelie, 2010</td>
<td>88 women</td>
<td>Pain</td>
<td>Specific stabilizing exercises, 2Xs a day with 10 repetitions</td>
<td>Disability measured with Oswestry Disability index, questionnaires looked at pain, quality of life, satisfaction and muscle function</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Participants</td>
<td>Intervention Details</td>
<td>Outcome Measures</td>
<td>Results</td>
<td></td>
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<tr>
<td>Hilde, Gunvor, 2013</td>
<td>175 women</td>
<td>Supervised exercise class, once a week for 16 weeks</td>
<td>Questionnaire, ultrasonography manometer 6 months postpartum</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kim, Eun-Young, 2011</td>
<td>18 women</td>
<td>Supervised sessions (23 sessions) 1 hour each, 3Xs a week for 8 weeks</td>
<td>Bristol female lower urinary tract symptom questionnaire, vaginal function test using a perineometer</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marques J et al, 2012</td>
<td>33 women</td>
<td>10 sessions; 3/wk x 60min each; supervised by PT at home visits; pictures included</td>
<td>PF muscle contractility (digital palpation &amp; sEMG); ICIQ-UI SF &amp; ICIQ-OAB</td>
<td>No</td>
<td></td>
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<tr>
<td>Morkved, Siv, 2000</td>
<td>81 women</td>
<td>45 min exercise sessions once a week for 8 weeks, also including home based exercises</td>
<td>Questionnaire was given out 1 year postpartum to evaluate UI</td>
<td>No</td>
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<tr>
<td>S. Meyer, 2001</td>
<td>107 women</td>
<td>12 sessions that included 20 minutes of biofeedback and</td>
<td>Used questionnaire, clinical examinations, UI decreased in the PFMT group</td>
<td>No</td>
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<tr>
<td>Study</td>
<td>Participants</td>
<td>Outcome</td>
<td>Intervention Details</td>
<td>Method of Evaluation</td>
<td>Findings</td>
<td>Conclusion</td>
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<tr>
<td>Sleep, Jennifer, 1987</td>
<td>1800 women</td>
<td>Pain</td>
<td>Instructed by midwife coordinator for exercise sessions, complete a health diary (described specific exercise, with pictures) over a 4 week period</td>
<td>Used a questionnaire, chi-square test to see statistical significance</td>
<td>Significant reduction in pain for the PFMT group</td>
<td>Yes</td>
</tr>
<tr>
<td>Stuge, Britt, 2004</td>
<td>81 women</td>
<td>Pain</td>
<td>40-60 min Physical therapy sessions 3 days a week for 20 weeks with specific stabilizing exercises</td>
<td>Questionnaires measured pain and functional status</td>
<td>Specific stabilizing exercises appears to be more effective to treat pelvic girdle pain after 20 weeks and 1-2 years after pregnancy</td>
<td>Yes</td>
</tr>
<tr>
<td>Sut, Hatice, 2015</td>
<td>60 women</td>
<td>UI</td>
<td>Instructed on how to perform kegals, 10 contractions 3Xs a day</td>
<td>PFM strength measured with perineometry, urinary symptoms measured with OAB-q, voiding functions measured with</td>
<td>PFM exercises increased PFM strength and improves urinary symptoms and quality</td>
<td>Yes</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>uroflowmetry</td>
<td>of life.</td>
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Appendix B: Scoring of Articles
1) Objective is clearly described
2) Main outcomes clearly described
3) Characteristics of patients clearly described
4) Interventions clearly described
5) Distribution of confounders in each group clearly described
6) Findings clearly described
7) Provides estimates of the variability
8) Adverse events that may cause interventions been reported
9) Patients lost clearly described
10) Actual probability values been reported
11) Subjects representative of entire population
12) Subjects prepared to participate representative of population from which they were recruited
13) Staff, places, and facilities where patients were treated representative of the majority of the treatment for patients
14) Attempt to blind the study
15) Blind those measuring the outcomes
16) Was data dredging made clear
17) Time period for intervention and outcome the same for cases/controls
18) Statistical tests used to assess the main outcomes appropriate
19) Compliance with the interventions reliable
20) Accurate main outcome measures
21) Subjects recruited from the same population
22) Subjects recruited within the same time
23) Study subjects randomized to intervention groups
24) Randomized intervention assignment concealed from patients and health care staff
25) Adequate adjustments for confounding variables
26) Losses of patients to follow-up taken into account

<table>
<thead>
<tr>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>Total (out of 26)</th>
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<td>Citak, Nevin, 2010</td>
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<td>Dumoulin, Chantale, 2013</td>
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<td>Gagnon, Louise-Helene, 2015</td>
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<td>Morkved, Siv, 2000</td>
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Key: A: Reporting, B: External Validity, C: Internal Validity – Bias, D: Internal Validity – Selection Bias
Appendix C: Level of Evidence
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<td>Strong evidence</td>
<td>Pooled results derived from three or more studies, including a minimum of two high-quality studies which are statistically homogenous (p &gt; 0.05) - may be associated with statistically significant or non-significant pooled result</td>
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<td>Moderate evidence</td>
<td>Statistically significant pooled results derived from multiple studies, including at least one high-quality study, which are statistically heterogeneous (p &lt; 0.05); or from multiple low-quality studies which are statistically homogenous (p &gt; 0.05)</td>
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<tr>
<td>Limited evidence</td>
<td>Results from multiple low-quality studies which are statistically heterogeneous (p &lt; 0.05); or from one high-quality study</td>
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<td>Very limited evidence</td>
<td>Results from one low-quality study</td>
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<tr>
<td>Conflicting evidence</td>
<td>Pooled results insignificant and derived from multiple studies, regardless of quality, which are statistically heterogeneous (p &lt; 0.05, i.e. inconsistent)</td>
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</table>
References


