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PELVIC FLOOR MUSCLE IMPORTANCE – EVIDENCE BASED
INFORMATION WITH EMG-DEVICE ABOUT PELVIC FLOOR
MUSCLE FUNCTION: BOOKLET FOR THE USE OF MEDIVITAL
CLINIC

Degree Programme in Physiotherapy

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FUNCTION: BOOKLET FOR THE USE OF MEDIVITAL CLINIC

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The purpose of this Bachelor's thesis was to give evidence based information about pelvic floor importance, its physiotherapy, EMG-machine examination and to create a booklet about the subject for the use of MediVITAL CLINIC S.L. in Spain. Aim was to give understandable knowledge about pelvic floor structure, dysfunctions and how EMG is used as a part of evaluation and training in pelvic floor physiotherapy.

The thesis includes a theoretical part about pelvic floor structure, most common dysfunctions and introduces into pelvic floor physiotherapy. Emphasis in physiotherapy is on Electromyography biofeedback technique, which reveals method behind EMG and how examination progress proceeds. Information of the thesis is gathered from literature and articles concerning pelvic floor. Also specialized pelvic floor physiotherapist, with an experience of 20 years, introduced pelvic floor physiotherapy using EMG.

As a product of this thesis, informational booklet was created to share knowledge closer to clients. Target group was generally clients of MediVITAL and main aim was to enhance the understanding about pelvic floor physiotherapy and to lower the uncertainty to participate EMG examination. Booklet was translated to Finnish and English to serve all the clients.

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1 INTRODUCTION

Pelvic floor structure is located inside a human pelvic girdle, spreading from side to side between hip bones and pubis symphysis and sacrum. It is a structure of muscle, ligaments and fascia, that layers in three parts. (Weurlander 26.3.2014). We understand its function in toilet activities and somehow a part of sexual behavior but what is forgotten is that, it plays a huge role for our living habits and quality of life. Pelvic floor is most importantly a support of our posture, help of our core muscles and many times answer to our dysfunctions that trouble use in daily activities like incontinence, sexual problems or back pain.

Pelvic floor dysfunction is a silent but general problem, especially considering women population in different ages of life. But men face dysfunction with their pelvic floor likewise, at least together with problems coming up due to the aging. Like to any musculoskeletal impairment, physiotherapy can provide a good treatment for pelvic floor dysfunction by using different specialized techniques which is in this thesis therapeutic exercise with Electromyography (EMG).

Electromyography is biofeedback method recording the muscle action. In pelvic floor physiotherapy it is used with specially designed electrodes, showing the results on computer. This methods is one of the special areas of MediVITAL CLINIC S.L. in Fuengirola, Spain. At the end of this thesis is a booklet made for MediVITAL, which opens the importance of pelvic floor, EMG-physiotherapy and includes questionnaire for clients to test their need for pelvic floor physiotherapy.

2 PURPOSE AND OBJECTIVE OF THE THESIS

The purpose of this thesis is to tell about the importance of pelvic floor muscles in active daily living and introduce the EMG measurement as a pelvic floor therapy form. Aim is to create an informational booklet about the subject for the use of MediVITAL CLINIC S.L. in Fuengirola, Spain. Pelvic floor structure and function is many times forgotten in physiotherapy even though it has a huge role in person's daily activities and health. Author of this thesis wants to introduce the structure, general dysfunctions and physiotherapy, to make pelvic floor more known and to inspire the patients of MediVITAL to seek into pelvic floor physiotherapy and EMG-measurements more willingly.

3 PELVIC FLOOR STRUCTURE AND FUNCTION

You could compare pelvic floor to a diaphragm but it is under the abdominal cavity inside our pelvis or other words, inside our hip bones. Like diaphragm, pelvic floor muscles do not make certain movement in body when functioning but they are voluntary muscles and when used they contract up, creating support for spine, organs and core. Muscle of the pelvic floor create cup-like muscle-ligament layer that goes many directions. Overall these muscles cover area from pubic symphysis all the way to tailbone (os. Coccyx) (Figure 1&2), spreading side to side. (Höfler, 1999, 9-11.)

Anatomically pelvic floor can be divided into three sections which are pelvic diaphragm, diaphragm urogenital and the perineum. Pelvic diaphragm is the deepest and the biggest layer which consist two main muscles: M. Levator ani and M. Coccygeus. From these levator ani has a huge role in pelvic floor function. The middle layer spreads from pubic symphysis to coccyx to between tuberositas ichium. In this structure there is cavity on the muscle for genitals, urinary paths and vagina and anus. The third layer is for sphincter muscles. (Weurlander 26.3.2014.)

3.1 Bony pelvis

Bony pelvis or a pelvic girdle is ring like structure of bones that are combined by on the back sacrum and in the front pubic symphysis (Figure 1&2). Human pelvis has right and left hip bone or os coxae and it has three together grown parts: os ilium, os pubis and os ischii. (Arstila, Björkqvist, Hänninen & Nienstedr, 2014, 125.)

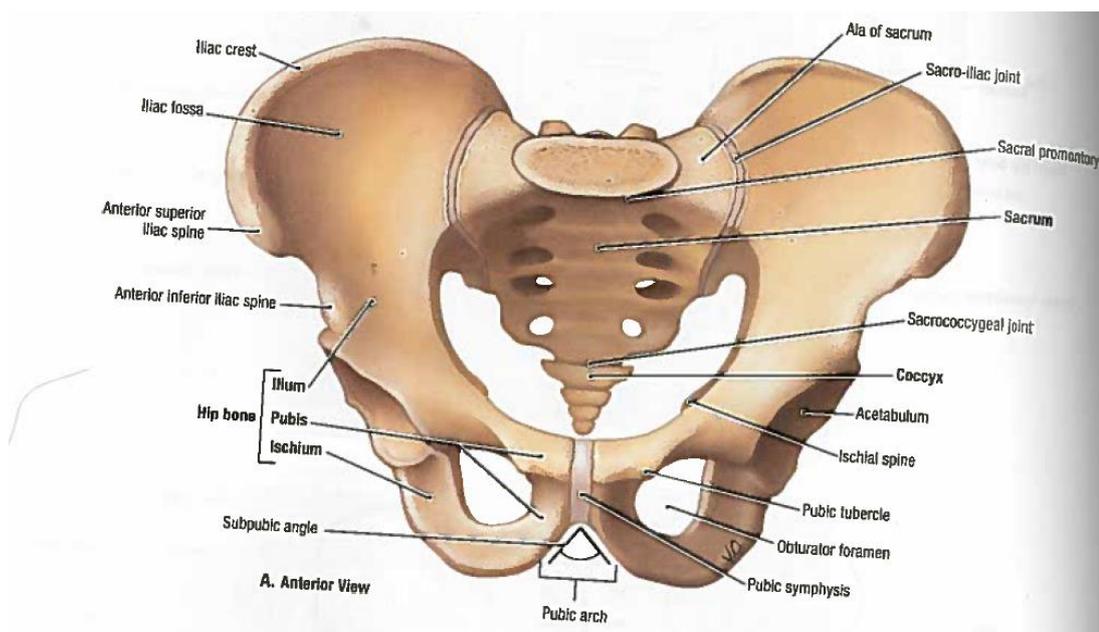


Figure 1. Bony pelvis, anterior view (Agur & Dalley 2013, 200).

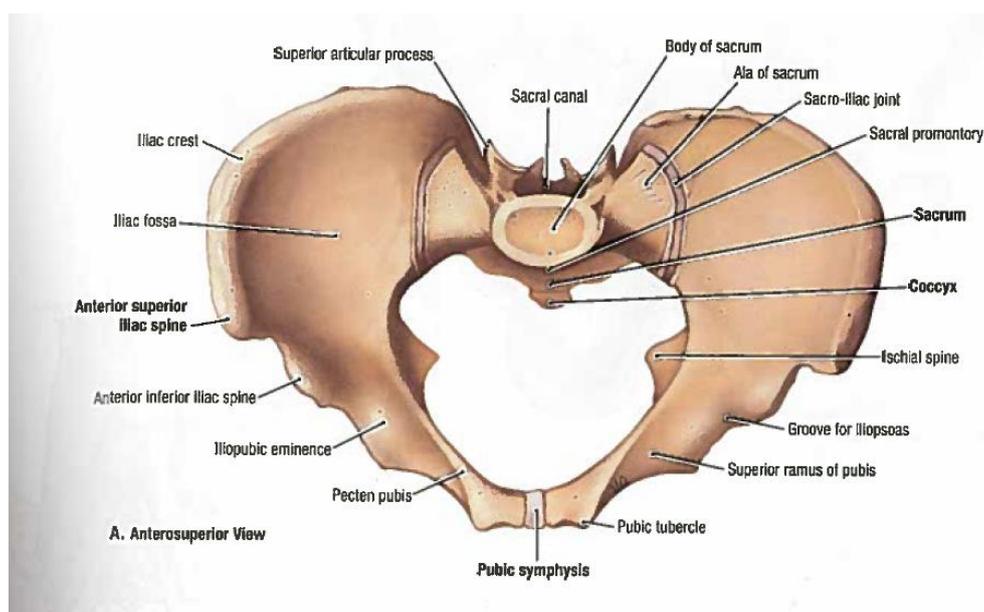


Figure 2. Bony pelvis, superior view (Agur & Dalley 2013, 201).

Hip bone also combines together the vertebral column or more commonly known as spine and our legs, femur bones. The bones of pelvic girdle can be palpated specially the anterior part, depending on the tissue around hips. Female pelvis is naturally wider than the male pelvis related to its role of making giving birth possible. In front the important joint that combines the hip bones together is the pubis symphysis and on the back sacrum and the hip bones are combined together by sacro-iliac joints or also known as SI-joint. (Agur & Dalley, 2013, 198-199.)

3.2 Soft tissue structure: muscles and ligaments

Like said before, there is many layers in pelvic floor, formed by muscles, ligaments and fascia. The pelvic diaphragm (PD) is formed by levator ani muscle group plus coccygeus muscle. Levator ani muscle has parts called m. pubococcygeus and m. ilio-coccygeus which m. pubococcygeus can be divided into two muscles that are named little different between women and men (Figure 3). Both genders have m. puborectalis but muscle working around genitals is named on male's m. puboprostaticus and on female's m. pubovaginalis. (Agur & Dalley 2013, 206-207.)

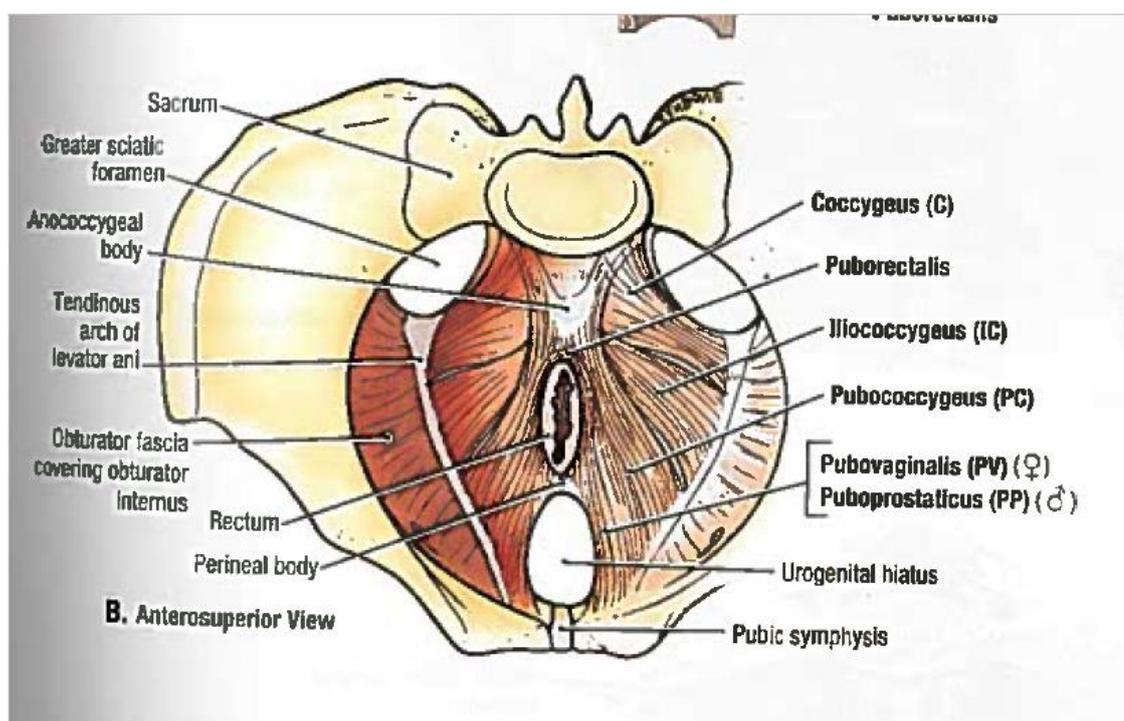


Figure 3. Diaphragm of Pelvis, superior view (Agur & Dalley 2013, 207).

When talked about pelvic wall or floor, part of its structure is also two muscles that are normally classified as gluteus muscles. *M. piriformis* and *m. obturator internus* (Figure 4) form the post lateral and lateral wall of pelvic wall. (Agur & Dalley 2013, 206.)

For the most superficial layer forms from sphincter muscles and from the muscles surrounding genitals (*m. bulbospongiosus*). This muscle builds little differently between men and women but its function is mainly same, supporting the area around genitals and urethra. (Höfler 1999, 14.)

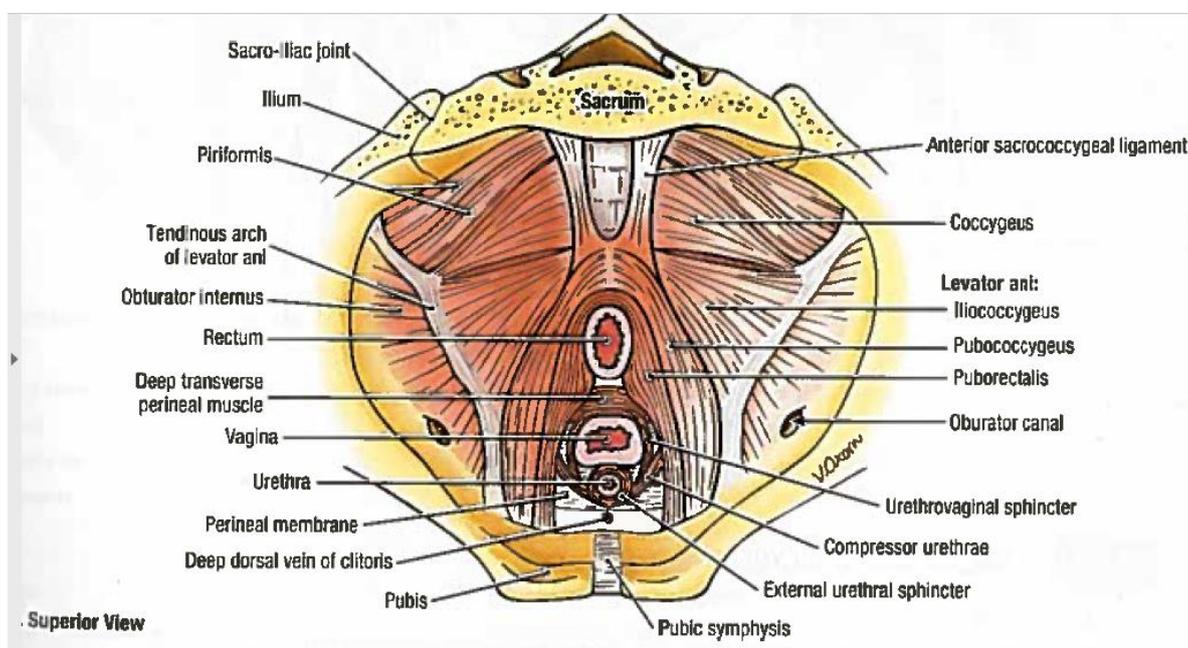


Figure 4. Perineum layer of female Pelvic floor muscles (Agur & Dalley 2013, 209).

Main pelvic ligaments are combining hip bones together and in the back to sacrum. Earlier mentioned pubic symphysis is cartilage like structure supported by ligament and plays a big role in the function of pelvic floor. Biggest ligament anteriorly are Anterior Sacro-iliac ligament, Sacrotuberous and Sacrospinous ligaments, iliolumbar ligaments and Inguinal ligament (Figure 5). Same ligament can be found also posteriorly (except Inguinal ligament). (Figure 6). (Agur & Dalley 2013, 205.)

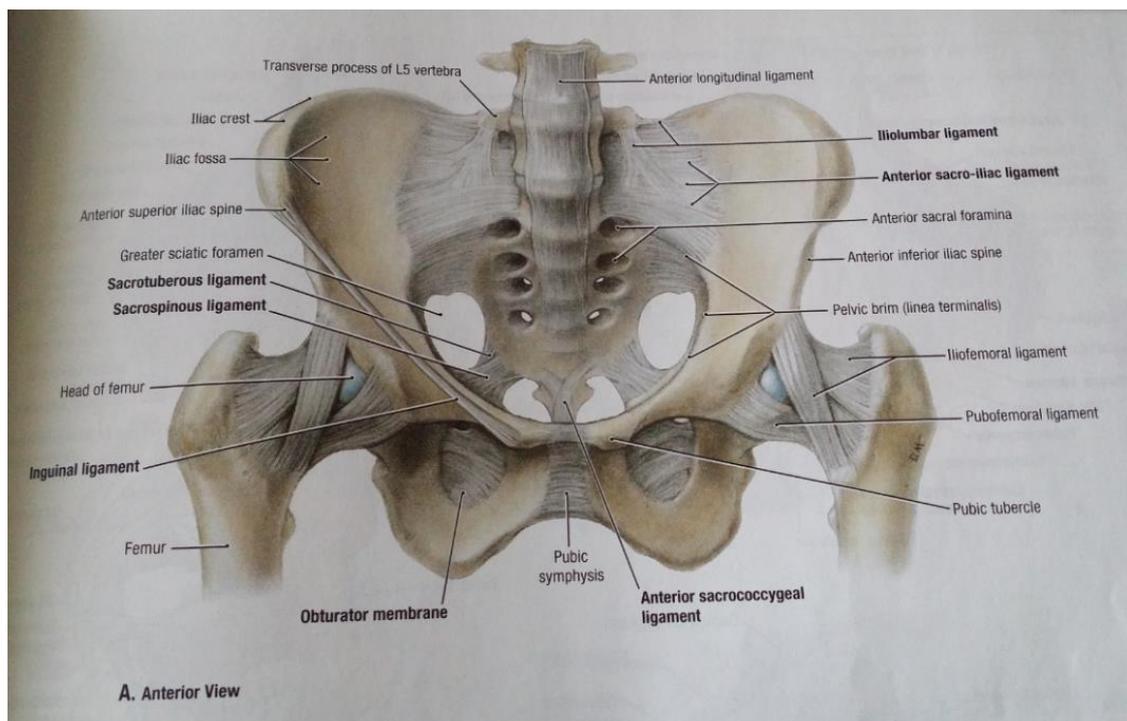


Figure 5. Anterior view of Pelvic Ligaments (Agur & Dalley 2013, 205).

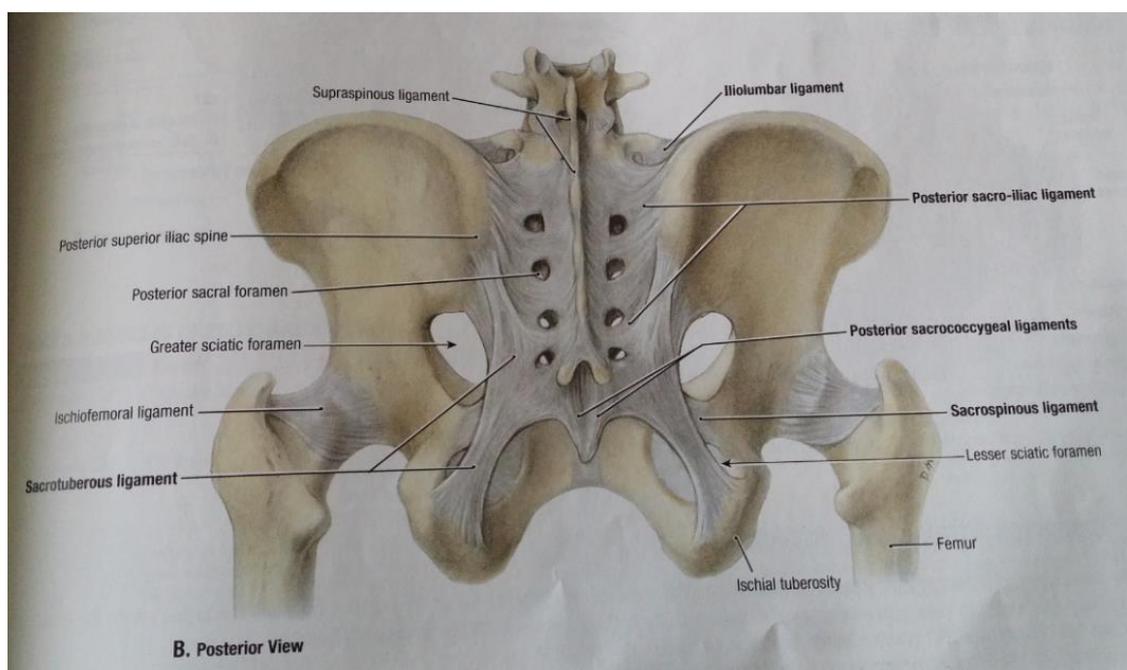


Figure 6. Posterior view of Pelvic ligaments (Agur & Dalley 2013, 205).

3.3 Function

You need pelvic floor muscles for activities that are mainly normal daily functions, like urination and defecation, continence, coitus and childbirth. These are activities we usually understand as a functions of pelvic floor. But on top of that, you need pelvic floor muscles for even more variety tasks. For example functions where the pressure of abdominal cavity increases like sneezing, coughing, jumping, lifting heavy objects and exercising. Muscles and other structures keep pelvic floor organs in place, support abdominal cavity and lift bladder, genitals and rectum. (Heittola, 1996, 13.)

Even we may think pelvic floor serves only the functions of pelvic organs, they are also most importantly one of the main supports of our movement and posture. Support of our gait and upright position. Pelvic floor should be considered as an important body part unit, part of whole body economy, maintaining posture, part of walking and behavior. We need to remember that pelvic floor has been developed during evolution as a part of our trunk, it is a middle point of our skeleton, the base of spine. (Salvatore, 2015, 28.)

For sexual functions pelvic floor (PF) plays a big role. Good pelvic floor muscles will increase the pleasure sexual action gives, because the sensitivity and blood flow is better. Orgasm will make pelvic floor muscles contract, so better the muscle strength, stronger the orgasm will be. If women suffers from coitus pain, pelvic floor treatment may be the answer to the problems. (Webpage of Seksuaaliterveysklinikka.fi.)

Urinary tract and pelvic floor work together with continence and storing urine and emptying the bladder. When bladder is filling up, contraction of PF muscles keep the tension holding urine inside by creating higher pressure to sphincter muscles than urinary tract. Once urination happens, PF muscles contract and are part of emptying the bladder. Normal, this kind of function requires good and healthy structures to maintain the continence and bladder to function normally. (Huttunen, 2008, 10.)

In the pelvic floor, rectum has two sphincter muscles. Second is smooth muscle tissue but the other one in voluntary muscle that can be trained. Defecation reflex fires when sensors of rectum wall sense the pressure of excrement mass. Rectum starts to contract

the mass down when at the same time the voluntary muscle will relax and mass can push its way out. This outer voluntary muscle can be trained to keep the continence. (Hallinen & Pulkkinen, 2011, 8.)

Pregnancy and Childbirth are maybe the biggest function of woman's pelvic floor. These two cause inevitably dysfunctions and damages to pelvic floor structures. On the other hand, hormones of pregnancy will prepare woman for coming changes but does not stop damages occurring to pelvic floor. (Aukee & Tihtonen, 2016, 2381.)

As long as the pelvic floor muscles function normally, the pelvic floor ligaments and fascia are under normal tension without any damages, there should not be bigger problems and pelvic floor is kept supported. But when pelvic floor muscles get weak, get damaged or too tensed, the support suffers and that has an impact on many functions of our body. (Bø, 2007, 1-2.)

4 PELVIC FLOOR DYSFUNCTION

Pelvic floor dysfunction is a very common problem, especially among women and aging people. Normally these cases are benign but they still have a big impact to the quality of life and even to daily functions. As a pelvic floor dysfunction is classified problems with urination, defecation and sexual dysfunction due to structural or functional reasons, such as incomplete emptying, erection problems and dyspareunia, gynecological and bowel prolapses plus all the pain symptoms in the pelvic girdle. (Aukee, Elomaa & Kairaluoma 2009, 125: 189.)

4.1 Urinary Incontinence

"Urinary incontinence prevalence average is 19% according to Andersson and others (2004) in material of Scandinavia, and in research done in Belgium prevalence was among men 5% and women 16% (Schulman and others 1997)" (Aukee, Elomaa & Kairaluoma 2009, 125: 189-196).

Even a third of adult women suffer from urinary incontinence and these problems get even more general with age, after given birth, obesity or just constipation and chronic cough. For men, urinary incontinence is rare problem among young and middle aged people but can relate to nerve or structural problems if they occur. But within age men suffer these problems also more and this usually is because the bladder may get smaller but same time muscle control gets weaker. Also men that have had a prostate surgery, generally have more incontinence problems. From over 70 year old men, every fourth have urinary incontinence. (Webpage of Duodecim, Terveyskirjasto 2015.)

Among men the most ruling incontinence problem is urgency urinary incontinence, where urine leaks out as result of urgent need of urinate. Prostate problems usually exacerbate incontinence for example over grown prostate may hamper bladder to empty which make continence hard. Also many general illnesses have effect on it too. Bladder can be overactive or drugs can have their own effect as well the simplest as having a strong lung infection and cough can result urine leaking. (Webpage of Duodecim, Terveyskirjasto 2015.)

In researches incontinence among women have varied between 5-58% of the population. Between age group of 25 to 60 year old women in Finland the number of prevalence have shown to be 20% and over 70 year old women 59%. The prevalence of incontinence is shown to increase towards age of 50-54 and then again after the age of 64. Incontinence causing mild harm seems to be two times more common than those ones that cause significant social or hygienic problems. (Webpage of Käypä Hoito 2011.)

Urinary incontinence can be divided mainly into three different categories and to a fourth one that is usually mentioned as its own. These types of incontinence are stress-, urge-, and mixed incontinence. The fourth type is called overflow incontinence. There are also some other extremely rare urinary incontinence types that will not be mentioned in this thesis. From these types the stress incontinence is the most common problem and often in connection with physical activity or same kind of other stress factor that creates huge abdominal pressure accompanied with leaking pelvic floor structure stability. This problem is a sign of mechanical disturbance where the extreme

pressure of bladder exceeds the pressure of urethral sphincter and leakage happens. (Webpage of Käypä Hoito, 16.12.2011.)

Urgency urinary incontinence then again is situation where before leakage of urine, patient feel urgent need of urination due to chronic bladder irritation. Irritation can be connected to urinary infections and their post-disease problems or gynecological or urinary ureteral surgeries. Within 80% of women the pathology is unknown but low estrogen may have some effect and also neurological conditions may cause urgency incontinence. (Webpage of Terveyskirjasto 25.10.2015.)

Combination of these two earlier ones is mixed urinary incontinence. It is more problematic to diagnose and the symptoms can vary a lot. According to guidelines it is important to start treating the symptoms from the most harmful one. (Webpage of Virtsarakko.fi 24.8.2015.)

The last type of incontinence is called overflow incontinence. There urine accumulates to bladder but it is hard to urinate out and it also does not create the need of urinate. In other words urine builds up too much and it starts “overflow” when the extreme pressure of inner urethra exceeds. (Heittola 1996, 64.)

4.2 Pelvic organ prolapse

Pelvic organ prolapse occurs when weakness of supporting pelvic floor structures, allows pelvic viscera to descend and ultimately fall through the anatomical defect. This condition has deterioration in quality of life and may cause bowel and bladder dysfunction and causes symptoms. Most symptoms are feeling of discomfort and heaviness in the pelvis, like some “lump” is coming down. Symptoms may be associated with chronic lower backache and urinary track symptoms. Many conditions can cause pelvic organ prolapse and some of those are pregnancy and childbirth, hormonal factors, constipation, obesity, exercise and previous pelvic floor surgeries. (Balmforth & Robinson 2007, 233-236.)

Treatments for pelvic floor prolapse will be planned by taking into account the symptoms and how severe the problem has been catheterized. On mild cases pelvic floor exercises are the most important treatment within pelvic floor physiotherapy. On these cases surgery is not usually an option but the most severe cases will need surgical attention. (Wiegersma, Panman, Kollen, Berger, Lisman-Van Leeuwen & Dekker 2014, 1.)

It is not rare to have more than one prolapse at the time. For example woman who suffers from vaginal prolapse may also have enterocele (small bowel prolapse) and rectocele (rectum prolapse). But the most general problems among women is cystocele, where bladder will prolapse against vaginal wall. (Huttunen 2008, 17.)

4.3 Fecal Incontinence

Fecal incontinence is surprisingly general problem but many times kept in silent. Some people may even think it is a normal condition for example after given birth and will not tell about it. Continence requires a complex cooperation of nerves and muscles and most of the functions happen unconsciously. According to researches, women suffer more from fecal incontinence than men and urinary incontinence is highly associated with it. Biggest risk factors causing fecal incontinence are surgeries to rectum area, problems in sphincter muscles occurring after childbirth and neurological diseases. Other causes can be bowel prolapses or intussusception. (Lehto & Törnävä, 2016, 42-43.)

Fecal incontinence occurs as a incontinence of fecal, constipation and leakage of intestinal gas (Heittola 1996, 74-75). In research of Tampere, five adult people from hundred had fecal incontinence problems at least two times a month. Most general cause is weak pelvic floor muscles and sometimes delivery damages. Symptoms vary from involuntary leakage of fecal or intestinal gas and these can relate to difficulties of defecation and to feeling that the intestine does not empty enough. (Webpage of Terveysportti, 23.11.2015.)

4.4 Risk factors

Factors that increase the risk of having some kind of pelvic floor dysfunction are quite normal common situations in life. Those are aging and menopause on women, pregnancy and childbirth, bad living habits like smoking and having obesity, work or sports that requires huge physical impact as well chronic cough and constipation. Also surgeries done for pelvic area may increase the risk of developing dysfunction to pelvic floor. (Aukee, Elomaa & Kairaluoma 2009, 125: 189-190.)

Predisposing risks can also occur as structural problem in muscle, nerve or tissue or it can be a hormonal problem that effects to some of these structures. Muscle tissue can get damaged or degenerate which is seen for example during aging when the muscle strength gets weaker. Pregnancy and giving birth may stretch the muscle tissue or even tear it. The other side causing dysfunction is over tension of the pelvic floor muscles, which causes pain and trouble emptying bladder or bowel. (Aukee, Elomaa & Kairaluoma 2009, 125: 189-196.)

Nerve damages are usually caused by deliveries, surgeries or neurological diseases and neuropathic diseases like diabetes. Like said earlier, pelvic floor is formed by many layers and has a lot of ligaments and fascia that support the function. Collagen and elastic factors can get weaker or lose their features and cause structural problems. Changing hormonal levels during different situations of life effects to pelvic floor muscles through general effect to muscle or soft tissue. For example, change in estrogen levels on women going to menopause weakens muscle tissue in all over the body, so also in the pelvic floor. (Aukee, Elomaa & Kairaluoma 2009, 125: 190-191.)

5 PHYSIOTHERAPY IN PELVIC FLOOR DYSFUNCTION

According to The World Confederation for Physical Therapy (WCPT), physical therapy is providing services to people and populations to develop, maintain and restore

maximum movements and functional ability throughout lifespan. Main physiotherapeutic area is to practice for musculoskeletal pain and dysfunction but many physiotherapists also specialize to fields such as neurological, cardiorespiratory or children's physical therapy. Overall in all aspects physical therapy aims to improve, maintain and increase the physical activity level and functional capacity. There for because, pelvic floor muscles work significantly in synergy with other trunk muscles, pelvic floor dysfunction may lead to symptoms during movement and restrict ability to stay physically active. In addition, pelvic floor physical therapy not only treats the function of pelvic floor but may also include physical activities for increasing general function and fitness level. (Bø 2007, 3.)

Reason to seek into pelvic floor physiotherapy can vary from the symptoms and diseases mentioned earlier in this thesis but it can also be simply a will to find out the condition of own pelvic floor muscles. Pre-, - and post operation, pain, posture problems and difficulties with daily body functions, could have a solution from pelvic floor physiotherapy. Because these muscles work together with deep abdominal muscles, they have a huge impact to posture and the control of core, health of spina, and functions like bowel and bladder action. Plus, many people have find cure for sexual problems like vulvodynia or erection difficulties. (Petro 2015.)

Role of Physical therapist specialized to pelvic floor physiotherapy is to work together with other health care profession like urologist or gynecologist. Therapist will do the assessment, diagnosis (physiotherapists own evaluation about the situation), planning of the treatment path and intervention and evaluation about the pelvic floor dysfunction. In treating pelvic floor, emphasis is on educating about the dysfunction, including it to life-style, manual techniques and in pelvic floor muscle training (PFMT). PFMT can be done with or without biofeedback (like EMG in this thesis) or other electrical stimulation agents. Teaching includes control and movement patient education which means correct contraction, muscle and body awareness, coordination and motor control and muscle strength and endurance and relaxation. (Bø 2007, 3-5.)

5.1 Patient education

First step in pelvic floor dysfunction treatment is to educate the patient about the anatomy and function of the pelvic area. Physiotherapist should use images, and visual helps to explain the three dimensions of the muscle complex. This will help the patient to figure what is talked about but also how to create the “lifting” motion when exercising the pelvic floor. Patient should get clear individual instructions in exercise performance to meet the criteria of skilled care, not just verbal instructions but also manual guidance. (Kisner & Colby 2012, 937.)

5.2 Awareness, training and strengthening

No matter the case or the symptoms of dysfunction, pelvic floor muscle training is valuable. Majority of the patients are not aware of their pelvic floor muscles or about their function and role in daily activities. Evidence have shown that pelvic floor muscle training is an effective way to treat pelvic floor dysfunctions and should be noted also in active daily living activities. (Kisner & Colby 2012, 949.)

Training can include variable position to meet the best possible effect of awareness, activity and motor learning. Forms of pelvic floor exercise are contraction-relaxation exercise where pelvic floor is contracted for few seconds like attempting to stop urine flow. Hold is for 3-5 seconds and then relax, this will be repeated for 10 times. Good technique should be observed and other muscle activities be as little as possible. For faster muscle fibers quick contractions of 15-20 per set while maintaining normal breathing, helps develop withstand pressure from above, especially with coughing and sneezing. “Elevator exercise” is challenging and requires an eccentric muscle work. In this exercise patient is asked to imagine lifting pelvic floor up, layer by layer but releasing the “elevator” down slowly. Relaxation of pelvic floor is linked to breathing, it helps to release the “elevator” and ability to relax pelvic floor muscles. This exercise comes especially important when patient is having chronic problems of relaxing pelvic floor muscles because these situation can lead to impairments such as hypertonus, pain, or voiding dysfunction. (Kisner & Colby 2012, 949-950.)

6 ELECTROMYOGRAPHY - EMG

Electromyography is method used to study the electrical activity on muscles. It records the passing muscle unit potential, which means electrical message from neuromuscular junctions along the muscle to activate the individual muscle fibers. EMG is been useful way to recognize contraction of particular muscle. Generally, to make the recordings, needle (placed on specific single motor unit) or surface electrodes (placed on skin, on top of the muscle) are used but more adapted electrodes have been developed. In this thesis focus is on the vaginal and anal electrodes, designed for pelvic floor physiotherapy. (Kitchen 2002, 302.)

6.1 Pelvic floor muscle training with EMG

Electromyography is biofeedback method to rehabilitate pelvic floor. Biofeedback gains awareness of physiological functions collecting information on the activity of those systems that are able to manipulate by will. It may be used to improve health, performance and physiological changes and researches show that biofeedback is effective way of improving pelvic floor exercises. Literature presents evidence that pelvic floor training done together with adjunctive therapies (such as biofeedback) has been more effective than pelvic floor training done alone. According to Cleveland Clinic, rationale for teaching pelvic floor exercise with biofeedback include weak muscles to lose their ability contract, prevent the substitute muscles working, increasing motivation and effectiveness of exercise grows. (Magovich 2013.)

EMG measurement will be done as a first assessment when patient arrives to physiotherapy, during the physiotherapy inventions whenever needed, and finally in the end of the treatment relationship. EMG gives the results in microvolts (μV) and every measurement should be repeated at least two times to make sure the reliability. EMG measurement is divided into five different sections:

1. First is measured the continuous (tonic) one minute activity in rest. Performed seated or if not possible then standing and also standing with and without support. Changes of activity and average are recorded.
2. Second part is measuring continuous one minute activity during voluntary contraction. Measurement position are sitting/standing and standing with and without support. Same results as earlier are recorded.
3. Next test is for reflexive response of pelvic floor muscles to sudden abdominal pressure changes. Patient is asked to cough 3-5 times and EMG will give feedback whether there is response or not. Measurement position needs to be recorded.
4. Spontaneous activation (not voluntary) of pelvic floor muscles during movement is measured while patient is either walking, jumping, jogging or stepping up. Activation needs to happen. Benchmark is patient continuous activity in rest.
5. Voluntary pelvic floor muscle activation is divided to two, because both slow and fast muscle fibers are tested. To measure the fast fibers patient needs to hold contraction for three seconds (work) and relax (rest) for 10 seconds, this is repeated for five times. Slow fibers are tested with 10 second work and 10 second rest, repeated in a row, five times. Average is recorded from the results. The peak value tells how many motor units are recruited into use during contraction. Also time to achieve the work and rest status are documented, as well as increment and decrease of them, and active change between contraction and rest time as microvolts.

Measurement should be performed in the same way next time and results compared to patients own set of values to be seen if there has been changes in the strength or function of pelvic floor muscles. Based on the results, physiotherapy plans together with the patient an exercise program, plan and goals. When development is seen, plan needs to be changed into more challenging by, for example, increasing contraction time and decreasing resting time. To intensify the re-education of pelvic floor, there is also developed a surface-EGM machine that patient can use at home when doing the planned exercises individually. This supports the motor learning and development. (Kurunsaari & Åkerman 2006.)

7.3.1 Goals of EMG-measurement

With electromyography, treatment goals are focusing on increasing functional use of pelvic floor. That means, treatment should always feel comfortable and it needs to be pain free situation, since one of the main goals can be pain relieve. EMG feedback should teach relax the over tension of the muscles, in addition patient should learn the difference between tensed and relaxed pelvic floor. That means increased ability to contract muscles and strength of the muscles. When blood flow would liven up, also the metabolism of pelvic floor will increase. (Kurunsaari 2008.)

6.2 Measurement method of pelvic floor muscles - EMG

Most common measurement method used to measure the maximum strength and endurance of Pelvic floor muscles (PFM) is squeeze pressure. Patient is asked to contract the PFM either hard as they can, as long as they can or repeat contractions as many time as asked. Measurement is done either in the vagina or rectum with a special developed device and currently there several types of devices available. (Bø & Sherburn, 2007, 63.)

6.3 Equipment

Pelvic floor muscle EMG measurement requires a private room with a toilet or a bathroom area where the client is able to change EMG electrodes, a computer with an EMG program and a biofeedback/stimulation device (Figure 5.) where the intra-vaginal (Figure 6.) or intra-anal electrode is combined. These days there is also wireless versions available. (Petro email 27.7.2016.)

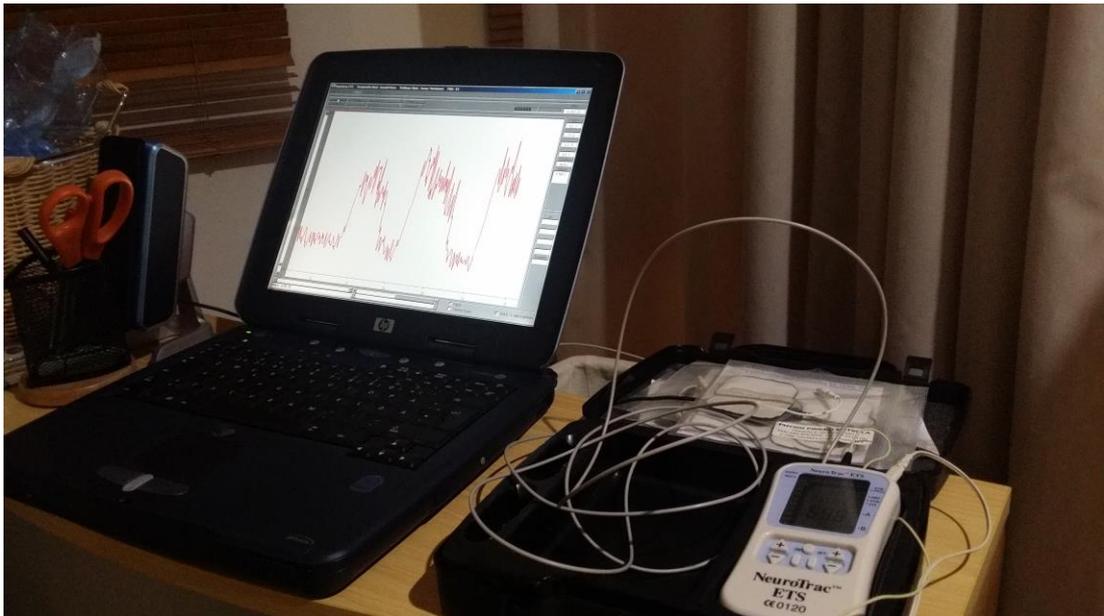


Figure 5. Computer and biofeedback/stimulation device (Mesiniemi, 2016).



Figure 6. NeuroTrac, intra-vaginal and intra-anal electrodes
(<http://www.saarasavolainen.fi/lantionp.html>, 6.10.2016).

6.4 Contraindication

With electromyography measurement, like every other electrotherapy treatment, there are certain contraindications why it is not suitable for everyone. Those are for example clients with pacemakers or that kind of other electrical device, heart problems, severe tumors or some diseases. Dry mucous membrane, loss of sensation, menstruation period, acute infections, pregnancy or less than eight weeks from delivery are one of the reasons not to do EMG. Also if a patient does not show motivation for the treatment or

is unable of understanding the reason for it, measurement should be considered again. (Friman, Hytönen & Villa, 2008, 32.)

6.5 Examination process

When client needs a pelvic floor physiotherapy he or she can contact the specialized pelvic floor physiotherapist or can get recommendation from another health care professional or Physiotherapist to have this examination. The first meeting is like any other physiotherapy meeting. Therapist interviews the client and makes all the needed patient assessments. Client has prepared for the examination with comfortable, stretching clothes. If woman gets her periods on the same time as the examination, then it cannot be done and the time needs to re-schedule. (Petro email 27.7.2016.)

After the interview and normal patient assessment, client goes to put on the electrodes (Figure 7.). If for some reason client cannot do this task independently, physiotherapist can perform the task and help if needed. First measurements will give the clients start condition. Usually physiotherapist starts the examination client laying on supine. This is the easiest position for pelvic floor muscles to function. Most important thing is to make client to find and understand how to contract the pelvis floor muscles, which means learning how to locate them in the body and activate them. If clients muscle strength and control is good enough, next step would be to see the function on sitting and then standing. But most of the times the first few meetings are exercised on supine, because the control and strength is usually weak but after few sessions of exercising client can move to more challenging positions. (Petro email 27.7.2016.)

After checking the starting point, physiotherapist makes a care plan and exercise plan together with a client. Patient assessment includes normally also the posture checkup and examination of rectus abdominals separation. (Petro email 27.7.2016.)



Figure 7. Client with electrode on and combined to EMG device (Mesiniemi 2016).

6.6 Results

Electromyography machine will give few different results of the function: nerve innervation and strength of pelvic floor muscles. It is important to measure the resting tonus of the muscles, where the goal is to reach $5\mu\text{V}$ or even less than that. Good ability to rest the muscles can help when learning right way of defecation in constipation treatment. Naturally next thing to measure is the maximum and the endurance conditions of the muscles and these results should be followed and developed during the exercises and therapy. Physiotherapist will also measure the spontaneous activation of the pelvic floor muscles that occurs for example during coughing. (Petro email 27.7.2016.)

7 THERAPEUTIC EXERCISE OF PELVIC FLOOR

Mainstay of pelvic floor muscle dysfunction physiotherapy is to educate the patient to use those muscles right. This will increase the lifestyle and knowledge about the dysfunction when Pelvic floor muscle training (PFMT) and manual therapy are combined.

This PFMT can be taught to the patient with and without biofeedback. Therapeutic exercise of pelvic floor physiotherapy is verbal and manual guiding combined with muscle strength training movements that increase function, strength, flexibility, and control and body awareness. (Bø 2007, 5.)

7.1 Therapeutic exercise

Therapeutic exercise is defined as systematic, planned performance of bodily movements, postures, or physical activities to improve, restore or enhance persons physical function, to prevent or reduce health-related risk factors and to optimize the overall health, fitness and well-being in once life. Therapeutic exercise done by a physiotherapist, are individualized and planned to the needs of the patient/client, considering all the aspects of individuals function, wellness and health. (Kisner & Colby 2012, 2-3.)

Concept Therapeutic exercise has huge variety of procedures that cover activities, actions and techniques to different cases and goals of the individuals needs for therapeutic exercise. Therapeutic exercise can be aerobic, muscle performance exercise, neuromuscular control, postural or stabilization exercises, body mechanics, relaxation, breathing or task-specific functional training and more. Regardless the type of therapeutic exercise or the goal of the program, safety must always be emphasized, no matter if exercises are done individually or in the supervision of physiotherapist. (Kisner & Colby 2012, 2-3.)

7.2 Pelvic floor and therapeutic exercise

Vital issue for preventing pelvic floor dysfunctions is naturally prevention. For this patients and health care professional should be very active but unfortunately knowledge about pelvic floor usually stays too little. Some exercises done uncourtly can cause harm and it is prominent to mention here that for example gym training requires good pelvic floor muscle strength. Pelvic floor has both slow and fast muscle fibers so it requires endurance, strength and maximal strength exercises but also needs to be relaxed as good as possible. (Heittola 1996, 97-98.)

To be able to start the Pelvic floor muscle training (PFMT), physiotherapist needs to make sure the patient is able to contract the pelvic floor muscles correctly and is aware about the function of pelvic area and about own pelvic floor. To activate and relax the pelvic floor muscles correctly and treating the dysfunction, physiotherapist needs to be able to educate the right techniques, possibly use biofeedback and know how to implement effective therapeutic exercises for the patient. (Bø & Mørkved 2007, 113-114.)

Pelvic muscle training has been proved effective way of treating dysfunctions during the decades. Patient not getting benefits from surgeries have experienced physiotherapy beneficial. When patients are motivated to long term training they get good benefits from therapy and to this has a huge impact of therapists way of motivate and support the patient. Guiding right pelvic floor muscle training technique requires many things. Contraction needs to happen in right specific muscles in pelvic floor and work of abdominal muscles should be minimal. Most general incorrect technique of performing muscle contraction is using gluteus and thigh muscles. This is where physiotherapist needs to be ready to react and guide. Breathing technique should also be considered as part of exercising, because it may be challenging to some patients. Like in all physiotherapy, patient's individual needs and skills need to be taken into notice. (Lehto & Törnävä, 2016, 44.)

High-quality and regular progressive training produces results. In researches, exercise dose varies but most popular doses is three times a day, second most popular dose requires three times a week but most general guideline talks about exercise continuing at least 12 weeks. In all cases slow contraction one set repetitions where 5-20 and fast repetitions where 4-10. Sets vary from 3-5 and some researches ask patients to exercise certain minute amount per day. Exercises also include relaxation exercises. (Mäkelä, Nykänen & Salminen, 2016, 49.)

8 MEDIVITAL

Client of this thesis is MediVITAL CLINIC S.L. in Spain, Fuengirola, offering physiotherapy and other health care. Alongside versatile physiotherapy, clinic has cosmetology, osteopath, orthopedic and psychotherapy services. MediVITAL is part of Finnish AURON nexus. (Webpage of Fysio-Eskola, referred 4.10.2016.)

MediVITAL CLINIC is created by private physiotherapy practice Fysio-Eskola working in Lappeenranta and the founder of company is Maarit Eskola-Heikkinen since 1984. MediVITAL was founded in 2005 to Spain, in purpose to offer same kind high-standard physiotherapy than in Finland. So far main clientele has been Finnish clients living or having a vacation in Costa de Sol but nowadays staff has language skill good enough to also work in English and in Spanish, so in the future company will emphasize its services also for British and Spanish clients. Staff includes Physiotherapist, Osteopath, Cosmetologist and Psychotherapist working with own trade name. (Eskola-Heikkinen, email 4.10.2016.)

MediVITAL is offering mainly musculoskeletal physiotherapy, where they focus on spine area and foot. Specialties are Sidas-insoles and with osteoarthritis clients, MediVITAL works together with Orthopedist Jyri Lepistö. One of the special area of MediVITAL is health tourism from Finland. It offers senior trip called BuenFeeling 2-4 times a year. (Eskola-Heikkinen, email 4.10.2016.)

Physiotherapist working in MediVITAL is recently changed (summer 2016). She has knowledge of Pilate instructor, lymph treatments and pelvic floor physiotherapy. Goal is to make pelvic floor physiotherapy more generalize now that new physiotherapist is a woman. So far pelvic floor physiotherapy has been only random for ten years except lectures and interventions pelvic floor physiotherapist from Fysio-Eskola has given when travelling to Spain. (Eskola-Heikkinen, email 4.10.2016.)

9 BOOKLET

Idea of the booklet in this thesis is to introduce importance of pelvic floor and tell facts about electromyography measurement. It hopefully will increase knowledge about the subject among clients but also aim is to teach and motivate people to participate pelvic floor physiotherapy. To be able to achieve this, it is required to think how learning happens, what is motivation and how to create these things through visual information package?

9.1 Learning and teaching material

In our life learning happens all the time. Sometimes it is unnoticeable but mostly it is done actively because something is needed to achieve and there motivation is required. Learning is creating changes and developing skills and knowledge. Over the years, learning have been seen as behavioral function where teacher gives information outside and learner needs to internalize it but more and more learning is understood as constructivist situation where learner actively needs to build skills and knowledge. Learning can be summarized as an interaction where learned develops experiences in his or hers skills, knowledge and attitudes happens permanent changes. Learning is individual and done always only by learner in his or her own way. But learning can have also problems which are mostly psychological or relate to attitudes. (Webpage of Verkko-Tutor, referred 19.10.2016.)

When people learn things that are related to movement and physical functions, can be talked about motor learning. Motor learning differ from cognitive learning in way they it is saved to another area of brain and motor learning is unconscious. Things that have an effect on motor learning are motivation, how skills is taught, imagination, stimulation, repetitions and feedback. This comes very important in pelvic floor muscle training and physiotherapy. (Hämäläinen, 2013.)

Teaching is guidance to supports the learning. To support the teaching materials like information packages can be used to create visual impact that learner to observe and

explore and that way increase individual knowledge and motivation to learn something new. (Webpage of Helsinki University.)

9.2 Motivation

Base of motivation is motives (in this thesis those could be reducing the pain, having better wellbeing, treating pelvic floor dysfunction). Motives can be divided to inner and outer motives and these drive people to achieve something they want, need or are keen to have. Booklet of this thesis hopefully fires the motives of people to think about their pelvic floor wellbeing and how it would effect on their health positively. Because rewards guide motivation good feeling and strong pelvic floor could be that reward that would interest people to participate to physiotherapy and EMG measurement. (Webpage of Terveysverkko.fi, 2011.)

9.3 Effect of the booklet

Effect of advertisements, info packages and booklets is based on suggestion. It uses many ways to impact on people, like pictures, colors, sounds and effects. Good advertisement for example will make people react somehow. Ways of making this impact for the product is to create clear personality for it. It needs to have target group, it promises something that is achieved easily plus, it uses professionals and researched knowledge and has visual impact. Those products that effect on feelings and personal things, seem to have bigger impact on people (e.g. own wellbeing and health). Important is to give people feeling that they are important and to wake up their interest about the subject. (Webpage of Utaj.fi.)

10 THESIS PROCESS

Below is a table of this thesis process (Table 1.). Topic of the thesis developed slowly and changed couple of times, but finally formed during winter 2015 when clinical

practice place in MediVITAL CLINIC S.L. confirmed and opportunity to work with this subject opened. Finally after specific topic choice, spring 2016 was mainly leaning, collecting information and getting familiar with it, along other studies and practice. Specialized pelvic floor physiotherapist gave private lecture about pelvic floor physiotherapy and EMG measurement 20.4.2016. During thesis process, meetings with other students and thesis tutor where held. Also communicating via email with pelvic floor physiotherapist was active during year 2016. Writing of the thesis was fast and was finished in a couple months on September and October 2016. I finished my thesis process in time and presented it in 18.11.2016.

Table 1. Thesis process

Planning and creating the topic. Idea from clinical practice placement for next spring.	End of the year 2015
Improving topic purpose of the thesis. Meetings with classmates and teachers about thesis process. Agreement about thesis with MediVITAL.	January-February 2016
Collecting information, getting known with the EMG equipment and pelvic floor physiotherapy during clinical practice abroad.	March-May 2016
Meeting with Pelvic floor physiotherapist. Own pelvic floor physiotherapy measurement with EMG.	20.4.2016
Writing theory of Thesis	September 2016
Planning and creating booklet	October 2016
Returning thesis to tutor teacher	14.10.2016
Presenting thesis	18.11.2016, SAMK, Pori

11 DISCUSSION

Pelvic floor physiotherapy is still slightly unknown part of Physiotherapy field and even more unfamiliar among clients. Situations and dysfunctions that would require Pelvic floor physiotherapy are many times kept in silent due to their sensitivity but most of the time reason is simply unconsciousness about the topic. Physiotherapists can specialize to this field and I feel that in Finland you have good opportunities to have Pelvic floor physiotherapy around the country but still treatments like this are done too rarely. I think in the future it would be nice to introduce more ways of offering pelvic floor physiotherapy. To tell, what are the optional treatment methods and in a way open the variety of pelvic floor physiotherapy to increase to knowledge and make this physiotherapy field more active.

During my physiotherapy studies I had almost unnoticeable, fast introduction about Pelvic floor physiotherapy within one course. Luckily topic came up again when I was orienting for my Clinical practice placement in Fysio-Eskola. They offer Pelvic floor physiotherapy by using Electromyography technology to measure to function of Pelvic floor and I had a chance to meet with one of the specialized physiotherapist. I got immediately interested about the subject when she started explaining me the idea about this kind of physiotherapy treatment. I felt like it was useful and helpful way of treating many problems concerning lower back, pelvic girdle, support of our core and it would increase the quality of life with many clients. The final contents of the thesis formed in the beginning of my practice in MediVITAL, after the problem of getting clients interested or dare to seek into EMG measurement and Pelvic floor physiotherapy came up. Aim was to create something that would give simple information about the unfamiliar subject but also make people to think about their own situation of needing Pelvic floor physiotherapy.

Wellbeing of Pelvic floor does not just effect on dysfunctions but it can also correct posture or ease back pain. For some reason Pelvic floor dysfunctions are many times understood only as a problems of women and elderly people but the truth is men, young athletes and mostly young women can suffer from these situations that effect to daily

living. Reason why these cases do not come up, is the sensitivity of the problem. Because of the location of the structure, treating problems and guiding physiotherapy for it, is challenging. And it does not make it easier that people actually do not understand how to use these muscles, if they even now they exist. To open and increase the information this thesis offers a booklet about the subject, that would hopefully make people more comfortable seeking into Pelvic floor physiotherapy and it also includes questionnaire which gives results about the need for therapy. I could recommend also to make a booklet about normal daily living situations where pelvic floor is important to remember and create a teaching package how to activate those structures for example when exercising, lifting or sitting.

Electromyography, biofeedback measurement is evidence based technology used to measure the function of Pelvic floor muscles. It detects the electrical stimulation of the muscles and shows the result right away on a computer screen. This makes finding, measuring and training of the muscle much easier for the client and physiotherapist. However, people are very cautious about the measurement, mainly because of how it is performed. It is very intimate area to be treated and measurement method goes farther than other physiotherapy forms. I want to reduce this fear in people and increase the knowledge about the measurement.

This thesis includes most of the general information about the topic. I wanted to tell about this physiotherapy field in a way that it would benefit everyone, not just women or not just people having incontinence problems but generally increase the knowledge about Pelvic floor function, importance and about this useful measurement tool called EMG. There is articles and researches about EMG in a treatment or measurement tool for certain dysfunction but, in my thesis I am considering it as a tool to use in every case needing for Pelvic floor physiotherapy. For the future, next thesis about the subject, could be developed in a way that it would tell more about the measurement and results. Also, it could include more information about Pelvic floor muscle training by using EMG. Furthermore, next writer could emphasize thesis more to importance of guiding in pelvic floor physiotherapy because it is a challenging area for the physiotherapist. People have difficulties finding pelvic floor muscles when exercising and guidance, verbal and manual, is very important part of the training then.

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APPENDICES

APPENDICE 1: Booklet, Lantionpohjan fysioterapia

APPENDICE 2: Booklet, Pelvic floor physiotherapy