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PHYSIOTHERAPY AND PREVENTION OF NON-SPECIFIC CHRONIC LOW BACK PAIN IN OFFICE WORKERS

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The aim of this thesis is to create an informative video for office workers about the prevention of non-specific chronic low back pain.

The objective of the video is to give to office workers information about the prevention of non-specific chronic low back pain. The information is based on reliable and updated evidence.

Prevention of chronic low back pain is something that awakens a lot of interest due to the fact that it has just increased its incidence. NSCLBP affects office workers a lot; it causes disability and problems to companies and governmental structures. Targeting prevention is key and needs to be done to improve quality of life.

As a conclusion, non-specific chronic low back pain is prevented the best way possible by changing the way society sees this matter in general; this goal is reached by educating patients and facilitating them the chance of having a healthy lifestyle in where physical activity, motivation and education are involved.

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1 INTRODUCTION

Non-specific chronic low back pain is a typical problem found in clinics and hospitals. This problem can also be found anywhere in the modern world. NSCLBP does not make many distinctions at the time of choosing who is going to be affected by it. Meaning that it can be found in any kind of social class, worker, age or race. In this thesis however the main focus will be on office workers suffering from it or that are in danger of suffering this. This symptom is nowadays one the most common seen in the world according to WHO and many articles. (Hoy DG, Smith E, Cross M et al. 2015, 4-7).

The low back tends to be one of the areas that office workers complain more about. (Hoy DG, Smith E, Cross M et al. 2015, 4-7.) Physiotherapists just do not try to fix the problem but they try to prevent them from happening and help relieve the symptoms a patient may have.

This thesis brings up evidence-based information about non-specific chronic low back pain. It will also go through basic anatomy, chronic pain, NSCLBP, office work, physiotherapeutic treatments and interventions and how we can prevent it. The thesis tries to educate the reader so that big issues following the appearance of CLBP either specific or non-specific can be prevented like, social, economical, mental and physical.

2 AIM AND OBJECTIVES OF THE THESIS

The aim of this thesis is to create an informative video for office workers about the prevention of non-specific chronic low back pain.

The objective of the video is to give to office workers evidence based information about the prevention of non-specific chronic low back pain.

3 NON-SPECIFIC LOW BACK PAIN

3.1 Impact

Non-specific low back pain is usually addressed as discomfort in the low back, meaning that pain will occur in the areas of the kidneys to the point where the buttocks start. Many people complain and suffer from pain or discomfort in the low limbs, either in one or in both legs, usually the posterior part. This problem can also turn into chronic pain after a certain amount of time. (Maher C, Underwood M, Buchbinder R, 2017, 736-747.)

It is also very common for clinicians and practitioners to have problems trying to find the correct nociceptive source and specific area where the pain is coming from, so pain turns non-specific and more complicated to diagnose and treat. Sometimes serious diseases, traumatisms or psychosocial problems can create a lot of pain in the patients therefore these possible problems need to be identified, addressed and treated as soon as possible to avoid pain turning into a chronic issue. (Hartvigsen J, Natvig B, Ferreira M. 2013, 27.)

All human beings suffering from non-specific low back pain tend to have some difficulties in different areas like social, economical, psychological and physical; like muscle impairments or anatomical mechanisms disorders, if we put these affected

individuals in the same group as people with no issues in the low back. (Hartvigsen J, Natvig B, Ferreira M. 2013, 27).

Low back pain is something to be taken seriously due to its huge increase and being the biggest cause of disability in the world in office workers and in almost every other profession. The cost of low back pain is not 100% measurable but it is easily seen as something really expensive; socially, economically and psychologically to the point where it can be compared to feared diseases like cardiovascular, autoimmune, cancer, etc. (Hoy DG, Smith E, Cross M et al. 2015, 4-7.) Costs in numbers can go up to 9-25 billion American dollars in high-income countries. In addition, the indirect cost of LBP in general is always much higher than direct costs and not easily measured. (Dagenais S, Caro J, Haldeman S, 2008.)

3.2 Specific and Non-Specific

Non-specific low back tends to be the most common symptom shown in patients and clients. The amount of non-specific cases can rise to 85-90% of low back pain complaints. (Koes BW, van Tulder MW, Thomas S, 2006.) This problem occurs more in female that are between 40-69 years old. (Hoy DG, Smith E, Cross M, et al. 2015, 4-7). As mentioned before, non-specific low back pain is the lack of a known pathoanatomical affected area or where is the place or thing that is originally causing this pain. Sometimes it could be possible to assume that the area in where pain originates, but there are still not enough reliable tests to accurately clarify these assumptions. (Hancock MJ, Maher CG, Latimer J, et al. 2007, 16.)

The biggest problem for clinicians is the lack of an accurate tool to address and understand the starting source of non-specific pain. The tools used are basic and work in some extend but do not deliver the most reliable information when it comes to treating and addressing the pain source. Using clinical reasoning seems to create much more potential when it comes to treatment and addressing of the nociceptive source. (Chris Maher, Martin Underwood, Rachelle Buchbinder, 2016.)

Subgrouping has turned into a very common practice in the world of physiotherapy when it comes to NSCLBP since it has made treatments and understanding the problem easier. (Waddell, 2005, 395-396). Some authors, though, comment that when chronic pain is very bad and has caused a serious degree of disability, it is better to not sub group. (Wand, O'Connell, 2008, 11).

O´Sullivan is a big believer of subgrouping NSCLBP into two different groups. These two groups are separated by psychosocial factors or centrally evoked pain and mechanical factors or peripherally evoked and then from those two groups new groups are found. (O´Sullivan, 2005, 242-255).

Mechanical factors sub groups are two; Movement impairment and movement control impairment. Movement impairment is basically hypermobility, pain and movement performed in a direction, while MCI is a multidirectional movement. There are usually limitations when performing a movement with MI and causes pain. MCI is often described as segmental instability or pain created by being in a posture or same position for too long. These two subgroups usually account for at least 60 percent of NSLBP, while non-mechanical groups account for 30 percent. (O´Sullivan, 2005, 242-255.)

When it comes to non-specific low back pain, psychological factors are many times deeply involved, like said before at least 30 percent of all cases are non-mechanical or centrally evoked pain. Psychological factors are one of the most important factors to have into consideration when assessing NSCLBP, because of how much disability they cause. People mistakenly believe that pain level will dictate how much disability there is, but there is evidence showing that psychological factors are way more crucial in this. This psychosocial/psychological or not mechanical related pain is for e.g. kinesiophobia, which is basically fear of getting injured again. This particular psychological factor tends to increase pain and with time it causes a higher disability percentage between the individuals that suffer from this. Kinesiophobia worries health professionals due to the irrational fear patients have of moving, because of the fear getting injured again creates. (Odole AC, Ogunlana MO, Dada O, Williams OO, 2016, 38-43) This factor increases pain due to the fact that it tends to cause inactivi-

ty, which then possibly causes depression and more symptoms like a sedentary lifestyle. (Sullivan et al, 2006, 8-18).

Work disability and pain are greatly affected by self-efficacy when a patient is diagnosed with NSCLBP. There is a big connection between this factor and pain levels because as the name itself says, self-efficacy is how much a person believes in its own abilities to be able to carry out a movement, task, job, etc. Self-efficacy is very important because it will dictate how much and how well a person can adapt to pain levels. (Bandura, 1997, 4-6; Anderson et al, 1995, 77.)

Other psychological factor and subgroup that can affect pain levels in NSCLBP is fear avoidance and hypervigilance. With this factor (hypervigilance) anxiety levels in an individual increase due to the enhanced sensitivity to pain and symptoms the individual has. The patients that suffer from this problem tend to exaggerate their symptoms because their mind is always expecting danger or painful situations. This factor is usually caused by some trauma or mental condition. Fear avoidance beliefs are very similar to hypervigilance and kinesiophobia. FAB´s are fear to getting injured or getting the spine in a worse condition by doing e.g. physical activity, which just makes the rehabilitation period and process slower and less accurate. (Vlaeyen, Linton, 2000).

A little percentage of the cases is identified as specific, just around 10 percent maximum 15 percent. Identifying the specific source of pain or affected area happens more often in the secondary and tertiary care. (Downie A, Williams CM, Henschke N, et al. 2013).

There are several disorders that are quite common to have if pain is specified in the assessment. The diagnoses that are usually given to patients by clinicians when there is specification in the root of pain are for example; radicular pain, radiculopathy, disc herniation, SI joint problems, stenosis, etc. (Koes BW, van Tulder MW, Thomas S, 2006.)

Radicular pain and radiculopathy is created by the inflammation and injury of the nerve root or ganglion. This is the typical pain that is described as radiating pain from the buttock to the leg and it involves the dermatomes. (Braun J, Baraliakos X, Regel A, et al. 2014, 875-877.)

Herniation of the disc and inflammation of the nerve is the main reason for this pain. This pain does not carry out neurological problems. (Braun J, Baraliakos X, Regel A, et al. 2014, 875-877). Radiculopathy and radicular pain cause three different things apart from pain, which are numbness, weakness and a possible loss of reflexes. (Braun J, Baraliakos X, Regel A, et al. 2014, 875-877). Due to the reason that radiculopathy and radicular pain do not necessarily come together doctors will often suggest doing an MRI to make sure what the diagnosis is. After conservative treatment has not been effective, however research says that evidence found showing the effectiveness and accuracy of MRI is quite low and not reliable at the time of giving a diagnose. (Jung-Ha Kim, Rogier M. van Rijn, Maurits W. 2018.)

In facet joint syndrome the zygapophyseal joints are the main affected structures in the vertebrae. These joints in the lumbar zone of the spine are formed by two different vertebrae, which are the inferior process of one and superior process of the other. (Hadley LA, 1961, 270-276). These joint are rich in nerve endings that usually can be in a capsule or totally free in this area. (Cavanaugh JM, Lu Y, Chen C et al. 2006, 63-67). The joints may get some degenerative problems with time or accidents and cause the cartilage get inflamed, which creates a lot of pain in the last parts of the nerve. This problem is very hard to analyze and diagnose, and usually needs a lot of very accurate radiological exams. Individuals complaining of this pain usually have discomfort from the back to the top of the knee and in some cases in the groin and tight. Most importantly individuals complain of back stiffness when they wake up and a good amount of pain when trying to get up from bed. There are also many cases in where pain aggravates when walking uphill or standing up from a chair after being seated for a while. (Filippiadis DK, Kelekis A, 2016.)

The facet joint syndrome accounts for 30% of CLBP cases. (van Kleef M, Vanelderen P, Cohen SP, et al, 2010). The syndrome is better identified by the use of clinical history and examination, however neuroimaging can still be very useful. The best imaging physicians can use are X-rays and then as a second option a CT scan. MRI can be also useful but only to some degree since it just shows non-specific signs of the problem in the back related to this problem. (Beresford ZM, Kendall RW, Willick SE, 2010, 50-56.)

In Sacroiliac joint pain the SI joint is the main affected structure of the back. This joint basically gives support to the body, specially its upper part, since this provides stability and support to this whole area of the body. The areas that are mostly affected are the intervertebral discs and upper areas of the low back joints. (Vleeming A, Schuenke MD, Masi AT, 2012, 567.)

SI joint problems and pain is quite common but the clinicians often leave it out of the diagnosis. It is really important to always think about it when there is postural pain in the lumbar zone. This pain tends to be created when there is tension in ligaments and in the capsules of the joints, it is also important to notice that this pain can possibly occur when there is hypermobility and myofascial or general dysfunctions in the kinetic chain and surrounding areas. If the individual is diagnosed also with Rheumatoid arthritis or disease the clinician may need to think about this situation and connect it with this SIJ pain or its connotations. To recognize this problem it is key to implement stress tests that can recreate or cause the described pain in the area. It is quite common to apply some kind of force or stress in the pelvis crest and upper thigh to recreate these painful moments in the individual. (Dreyfuss P, Dreyer SJ, Cole A et al 2004, 255-265.)

Lumbar spinal stenosis tends to be gained with time or/and can be congenital. This often happens by past surgeries done in the area that have caused some scar tissue or in other cases also by soft tissue thickening or enlargement. (Deyo RA, 2010, 625-627).

LSS is more commonly seen in patients with noticeable aging processes in their joints. This problem affects the canal in where the spine travels, which are indeed

quite, narrow already. A normal spinal canal can be from 15 to 27 mm of diameter. The affected spinal canal is usually 12 or less mm of diameter. As said before, stenosis is much more common in patients over 65 years old therefore this is not common to see in office workers, but more in elderly people. (Lurie J, Tomkins-Lane C, 2016.)

Dis. pain is according to some evidence, appears in 39% of the cases of chronic low back pain. (Helm li S, Deer TR, Manchikanti L, 2012). This pain appears when the intervertebral disc is degrading. (Manchikanti L, Singh V, Pampati V, 2001 308).

There is a lot of talk regarding the main cause of discogenic disks, but there is not a real answer for it since researchers have not been able to find a middle ground in what causes the problem initially, especially the inflammation. (He L, Hu X, Tang Y et al. 2015). An interesting fact that is provoking lot of discussion is that one of the possible reasons of dis. pain could be diabetes or at least it can increase its possibilities of appearance. To determine if the patient may be suffering from this diabetic problem, researchers have tried to find good data to back up their claims but so far the evidence found is not good enough yet. (Albert HB, Sorensen JS, Christensen BS, Manniche C, 2013.). As research mentions, MRI is not enough to determine if there is disc degrading, in addition professionals could perform a CT and a contrast injection. Another reason for this is that other factors or complications may be involved too in the problem. (Verrills P, Bogduk N, Vivian D, 2011, 36-44.)

3.3 Risk factors

There is a good amount of relevant evidence and information regarding the risk factors of LBP, however the evidence shown will not be 100% conclusive, because there is always the chance that there is new or a combination of factors creating the problem (Kaplan et al. 2013).

To start, it is key to put attention to LBP appearance in early childhood, because this tends to be an initial risk factor in the life of an individual. This can be an indicator of chronic pain development in the low back area for the individual when growing old if they already had pain when they were young. (Schaafsma FG, Whelan K, van der Beek AJ, 2013.) Workers in the field of health care, either occupational or primary health care, need to be the first ones involved in prevention by promoting health care itself either when a patient comes complaining already of pain or when there is no pain at all. (Website of Käypä hoito 2017).

Inactivity is also one if not the most important risk factor of LBP and CLBP. The lack of physical exercise can cause serious problems not just physically but also mentally like depression, which has been linked together with low self-stem as one of the precursors of the chronification of low back pain. (Shiri R, Karppinen J, Leino-Arjas P, 2007.)

Lack of exercise creates weak muscles in all the possible departments of the LB structure (ligaments, muscles, tendons, disks, bones, etc.) and also increases the chances of developing depression, which is considered as one of the biggest risk factors of CLBP and its severity. Having an unhealthy lifestyle in general, like not doing physical activity, smoking and not taking care of the mental health is totally contra productive and can be the cause of CLBP in general. (Ramond A, Bouton C, Richard I, 2011, 12-21.)

Some activities or habits (e.g. smoking) people can have are usually considered risk factors, because these activities tend to decrease the blood flow, nutrition of tissues and oxygen delivery to the muscles and soft tissue surrounding the lumbar zone. There has been a good amount of research done in the matter and they usually conclude that there is usually a bigger incidence of LBP in active smokers. (Shiri R, Karppinen J, Leino-Arjas P 2010, 7-35.)

Other physical factors regarding health care that are also very important and they tend to be forgotten by the population, like for example obesity, tend to increase the risk of having chronic and severe low back pain. (Lidar Z, Behrbalk E, Regev GJ, 2012).

Some other risk factors of LBP that are feared by people are usually quite well known already, like lifting big loads at work (physical jobs), being in a similar and bad position for a long period of time; it is also worth mentioning the risk factor of vibration, since it is well related to the prevalence of pain in the low back. Adding to the postural idea of it being a risk factor we can say that sitting down will always bring more solicitations to the column due to gravity and biomechanics, but unfortunately a relation to the incidence of LBP has not been proved yet in a conclusive way. (Griffith LE, Shannon HS, Wells RP, 2012, 309-318.)

Genetics is also another factor that increases the incidence of low back pain, however, an individual gene´s effect is very little. Another factor would be the environmental and behavioral elements and these ones tend to interfere with the hereditary factors. (Williams FM, Bansal AT, van Meurs JB, Bell JT, Meulenbelt I, Suri P *et al.* 2012.)

Even though we have identified the many different risk factors that can be helping to cause LBP we are still unable to know 100 per cent sure why it is happening, where in the low back and how to prevent it accurately in many cases. (Kaplan et al. 2013).

4 CHRONIC PAIN

Chronic pain is a term coming from the word “khronos” which means time in Greek; by this the understanding of chronic pain can be deduced as something that is strongly tied to time and duration. Pain classification in general is strongly tied with time therefore its classification is going to solely depend on its duration. There are three phases of pain, which are the acute, sub acute and then the feared chronic pain. First phase tends to last maximum 6 weeks; the second phase another 6 weeks, so 12 weeks maximum and the last phase is over that 3-month line. Chronic pain is usually

considered when the discomfort lasts more than 3 months. (Saab 2014.) More than just 10 percent of the world suffers from this pain. One of the biggest problems is that not even common pain medication can cure it and fix the cognitive effects this pain causes to the human brain and body structures. (Website of Society for Neuroscience 2017).

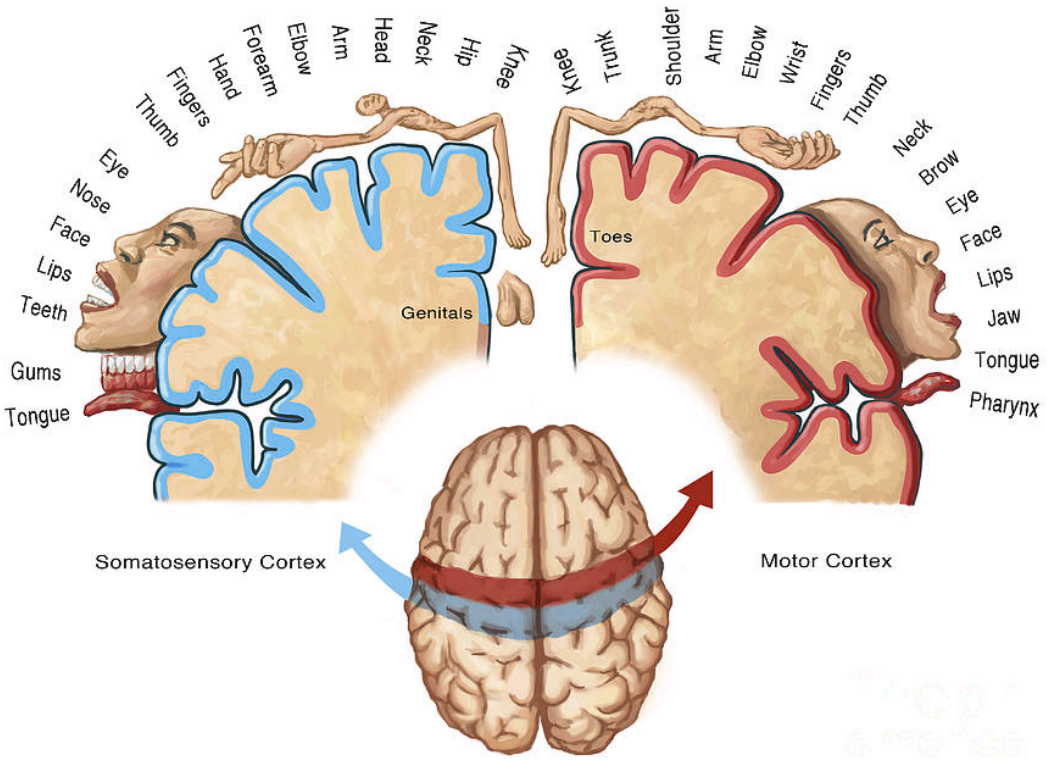
It has been shown that it is very difficult to diagnose the start and the reason of chronic pain in the body, but it tends to be usually associated with different factors like stress and fatigue. When there is chronic pain or pain in general, it is very easy to start creating some muscle imbalances due to the bad repercussions chronic pain has on the body, like changing the way we move causing wrong movements; which then create weakness, atrophy, lack of stretch ability and postural changes. (Saab 2014.)

Butler and Moseley have explained in their book that pain can be created and affected also by cultural reasons, age and/or gender. For example pain is not absent from little kids nor is absent in 60-year-old adults, but we know that low back pain is much more recurrent in working age people and women, which creates some questions like why and what is the reason for this? Unfortunately these are questions that have not been answered accurately yet. (Butler, Moseley, 2003.)

When it comes to gender it is important to realize that each one of these genders have a social role to fulfill and those roles tend to change our perspective of pain, plus our morphologies tend to have some differences that may have some inherences in the development of LBP. It is exactly the same with age and then when you add the factors of gender, ethnical group or cultural background the social role changes and the perception of pain too. Social roles take us to cultural effects, the best example for this is how northern Europeans usually see taking the sun as something warm and nice and many people in the Mediterranean area see that as something painful and unnecessary. This is why low-income to high-income countries or societies need a different approach when it comes to addressing pain and guidelines in how to prevent it. (Butler, Moseley, 2003.)

It has been discovered that chronic pain can shrink and inhibit brain cells. The cells that are affected are usually in the pre-frontal area of the cortex. It is very important to mention that in this area decision-making and present memory happen. When there is pain for very prolonged periods of time the brain starts to show us a big change of functional and structural differences if we compared to a brain before suffering chronic pain. These differences caused in the brain by chronic pain tend to cause bad effects on the cortical homunculus. This cortical homunculus is a vital part of what makes us human. It is basically the representation of the body in the brain. (Website of Society for Neuroscience 2017.)

What creates the homunculus are sensory receptors the body parts have, the more receptors we have the bigger the image of that body part will be in the brain, which then will rule how much sensation and sensitivity a body part will have. All these factors work by creating a somatosensory map in the brain (Picture 1.) and as written before the more sensitivity is what creates a bigger map in the brain by connecting all the receptors found. (Website of Society for Neuroscience 2017.)

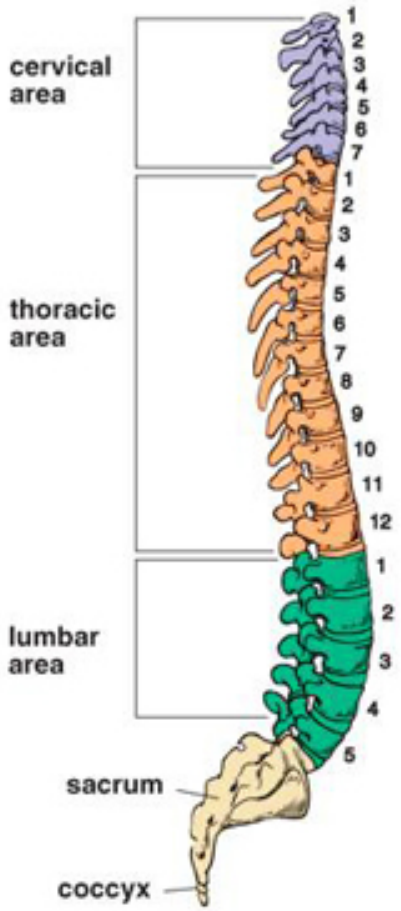


Picture 1. Homunculus map in the brain. (Sutton S, 2018).

5 THE LOW BACK

5.1 Structure

The back or more specifically vertebral column is made of 24 vertebrae that are separated (Picture 2.), 5 that are pasted or fused in the sacrum and 4 more that tend to be fused and separated coccygeal vertebrae. The rib or thoracic area consists of 12 vertebrae, the neck area has 7 and then the lumbar area, which is the one we are going to focus in this thesis, is made of 5 vertebrae. The vertebrae protect the spinal cord; this spinal cord has nerves that come out of the vertebral canal via the intervertebral foramina. In the lumbar zone there is 5 nerves that go all the way down to the low limbs. (Anne M. R. & Arthur F. Dalley II. 2016.)



Picture 2. The spine and its different parts. (Website of Spine Surgery 2013).

The back has a lot of muscles and all of those muscles are usually differentiated in two groups, which are deep muscles and superficial muscles or mobilizers and stabilizers muscles. It is important to notice that core muscles, even though being situated in the anterior part of the body, are very relevant in back stability and structural strength. (Leppäluoto ym. 2012, 1-2). There are three main and most important ligaments in the spine and those are the ligamentum flavum, anterior longitudinal ligament (ALL), and posterior longitudinal ligament (PLL). (Palastanga, N. & Soames, R. 2012).

Blood supply in the spine is an interesting and often forgotten topic in the area, since this part of the body has lot of arterial supply and venous drainage. A key concept in the anatomy of the back and spine is the intervertebral discs, which are basically cushions that avoid touch between two vertebrae. This cushion like structure is gel full of fluid. (Anne M. R. & Arthur F. Dalley II. 2016.)

The low back or so-called lumbar zone is quite an interesting area of the spine in where 5 vertebras make up this area stable. In addition, low back stability is not just caused by these 5 vertebrae but also by its complicated anatomy. To start talking about this lumbar area anatomy, understanding the different structures like ligaments, muscles, tendons, nerves and joint capsules turns out to be vital. All of the factors mentioned already is what creates its stability, flexibility and protection the spinal cord and body may need depending on the solicitations or external forces the individual may be producing to the body and spine. (Cavanaugh JM, Ozaktay AC, Yamashita HT, King AI 1996, 1117-1129.)

5.2 Vertebrae and facet joints

These are the bones that protect the spinal cord by creating a canal in where the spine itself travels down the body. These bones are of different size depending on the spine

area, some areas like the lumbar have larger and denser muscles because this area in particular needs to handle much more weight, stress and forces. The facet joints are in the vertebrae and they will allow your body and spine to move around controlled, especially when rotating. These joints are very similar to the knee or hip when it comes to cartilage, so it is common to develop osteoarthritis. (Orthoinfo Website AAOS, Referred 2019.)

5.3 Spinal cord and nerves

The spinal cord and nerves are connected. Nerves come out of the spinal cord and these are the responsible agents of carrying messages of action and reaction in the body. The spinal cord is a very long organ going from the skull to the first two lumbar vertebrae. After this there is just a bunch of nerve roots that are called cauda equine. This is the organ that is protected by the bones in the vertebrae; it travels in the canal these bony structures create. (Website of Orthoinfo AAOS 2019.)

5.4 Intervertebral disks

Just like the name itself says, these structures look like disks. They are not very thick; their structure is usually half an inch of thickness. These disk-looking structures are always found in between vertebrae. (Tortora & Derrickson 2011.) There are two main parts of the disk that helps it do its function. The first one is the annulus fibrosus, which is the outer part of the disk that helps the whole structure be flexible by being alike to elastic bands and being made of collagen fibers that are put together in layers. The structure usually has 10 to 20 layers of collagen. The second part is the nucleus pulposus, which is filled partly with water and makes it similar to a sponge (Tortora & Derrickson 2011.) This part of the disk is found right in the middle and it is the responsible of giving the disk its well-known strength and mobility. These two parts of the structure work together to keep the whole spine in place and stable by working as absorbers of the stress or solicitations applied in the spine. The nucleus gets big when there are solicitations in the spine and the other structure in the outer part keeps it in its place. These structures of the spine are avascular which means that

they do not transport blood into themselves because they do not have any blood vessels or arteries. (Orthoinfo AAOS Website Referred 2019.)

Since they do not have any blood vessels they need certain exercises to get some oxygen and nutrition. These exercises usually involve the disks being compressed by some stress and then left to open again. This is a very important point in rehabilitation because it helps in the process of getting rid of pain or anomalies in the spine. (Tortora & Derrickson 2011.)

5.5 Muscles

When it comes to muscles of the back it is basic to understand that this zone of the body is basically connected to many other areas due to the fact that this grants the body the necessary stability to realize functional activities. The core muscles are very important when it comes to giving strength and stabilization to the structures in the back specially the low back (Hall, S. J, 2007.) In this area the muscles have two different goals; stabilize and create movement in the spine. Superficial and deep muscles are also involved in the classification of muscles that help move and keep the back in control. (Budowick, Michael, Bjålie, Jan G., Rolstad, Bent & Toverud, Kari C. 2008).

The most visible and superficial muscle the body has in this area is the six-pack or scientifically known as rectus abdominis, the others muscles involved are the external oblique and the internal oblique (Budowick, Michael, Bjålie, Jan G., Rolstad, Bent & Toverud, Kari C. 2008). These muscles work together and make the upper part of the body move in different manners, like for example lateral flexion, which is done mostly by the oblique. Another basic movement these muscles create is flexion of the trunk; mostly done by the so-called six pack (Hall, S. J, 2007). The most important of all the muscles involved in spine movement and stability is the transversus abdominis, which is the deepest of them all in this area and its main task is to keep the spine totally stable while it is activated, by creating a big amount of pressure in the abdominal cavity or abdomen. (Leppäluoto ym. 2008; Leppäluoto 2012, 1-2).

Secondly comes the multifidus, which is also a key factor in the stabilization of the lumbar spine and also when moving it around. This muscle belongs to the group of trasnversospinalis deep muscles (semispinalis and rotators muscles). (Hall, S. J, 2007). The multifidus starts from the sacrum to the spinous process of the axis. (Tortora & Derrickson 2011).

Other muscles involved in keeping the back stable with the erector spine and multifidus is the quadratus lumborum by being an oblique muscle that connects the transverse process and the iliac crest. This muscle works together with other groups of stabilizers like the erectors of the spine, which create some movement in the lumbar zone. These three muscles (longissimus, ilicostalis and spinalis) do not connect with the lumbar zone, however they have a big influence by working together with the multifidus, mainly by going over the spine. (Hall, S. J, 2007.)

There is also muscles involved in the stabilization and movement (Table 1.) of the spine that are not located specifically in the back or lumbar zone, but in the lower limbs, which makes sense since in some point the human body needs to move by transferring weight into different areas by performing movements like rotation, flexion, extension, etc. These muscles are in the legs and hip, like for example bicep femoris, iliopsoas and gluteus muscles, showing that the body indeed works as a unit. (Sahrmann 2002, Anne M. R. & Arthur F. Dalley II. 2016.)

Table 1. Function and classification of the muscles involved in the lumbar zone

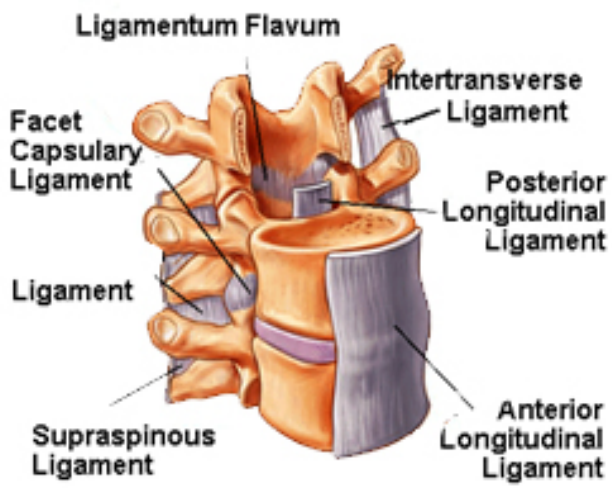
Stabilization of spine	Mobility of spine
Transversus abdominis (Deep)	Rectus abdominis (Superficial)
Quadratus lumborum (Lower Limb)	Bicep femoris (Lower Limb)
Multifidus (Deep)	Multifidus (Deep)
Obliques (Superficial)	Iliopsoas (Superficial)
Latissimus dorsi (Superficial)	Gluteus muscles (Lower Limb)
	Interspinalis (Deep)
	Erector spinae (Deep and Superficial)
	Latissimus dorsi (Superficial)

5.6 Ligaments and tendons

Tendons in the spine help the structure stay stable by linking the muscle tissue to the bone, which in this case it would be the vertebrae. (Spine Surgery Website).

Ligaments are key factors in helping the spine stay stable when there is no active moment and when there is active movement. Ligaments also help reduce the risk of lesions when performing hyper movements. Like it was mention before in this thesis anterior longitudinal ligament (ALL), posterior longitudinal ligament (PLL), and ligamentum flavum (LF) are the main and most important ligaments for the structure. (Cavanaugh JM, Ozaktay AC, Yamashita HT, King AI 1996, 1117-1129.)

The ALL and PLL are present from the cervical to the lumbar area, front and back. The LF (Picture 3.) is basically in the back of the spine just bordering the structure together with other structures of soft tissue. (Cavanaugh JM, Ozaktay AC, Yamashita HT, King AI 1996, 1117-1129.)



Picture 3. The spine ligaments shown in the bone structure. (Website of Spine Surgery 2013).

6 OFFICE WORK

6.1 Explaining the job and loading factors

Usually the job of an office worker is a salary based work place that happens most of the time in an office either at home or at a building of offices for example. The worker usually is at disposition of a boss or just works independently. The tasks an office worker is predisposed to will always be bonded to a due date of start and finalization. (Kääriä S, Kaila-Kangas L, Kirjonen J, Riihimäki H, Luukkonen R, Leino-Arjas, 2005, 1211-1217.)

This work is demanding when it comes to time, mental and emotional health. Office workers can also be affected physically even though they are not "demanded a lot physically". The biggest concern when it comes to physical demand is ergonomics which are all the factors related to physical effort. These factors more specifically are muscular stress, either static or dynamic; postures and common movements the body goes through the job routine. Office workers usually sit for very long periods of time and tend to use computers for too long, which can cause bad postures and ergonomics problems. In addition, a sedentary lifestyle is very possible creating pain and musculoskeletal problems. (Kääriä S, Kaila-Kangas L, Kirjonen J, Riihimäki H, Luukkonen R, Leino-Arjas, 2005, 1211-1217.)

6.2 Work ability

The main idea of work ability is basically the skill an employee has to realize his job related activities, taking into consideration his workloads, health, how he is physically talking and the state of his mental health. With all this workers functional aging can be measured. (Bellusci SM, Fischer FM. 1999, 602-609.)

This definition is put in a specific area of processes associated with human resources when it comes to performing a job. This is usually called dynamic process. (Ilmarinen J, Tuomi K, Seitsamo J. 2004). This process has a lot of different elements in where the health of the individual tends to be one of the most important ones. Oth-

er elements found in literature can be, age, the way an individual lives: which usually implies economical, social and demographical features. (Ilmarinen J, Tuomi K, Seitsamo J. 2004).

The topic of work ability has been taken into serious consideration and investigation since the beginning of the 90´s. (Ilmarinen J. 2001, 546-552). Work disability means; the need to cover certain areas like activity limitations, impairments, participation restrictions, etc. When one or multiple of these factors are affected then work participation can be affected thus causing an absence or lack of ability to carry out the desired job. (WHO 2001.)

Low back pain is the most common reason found all around the world when office, factory or company workers cannot go to work. (Lancet 2016, 1545.) This problem seems to be more recurrent in third world countries, where there are not enough regulations and worker protections like in first world countries. (Lucchini RG, London L. 2014, 251-256).

6.3 Economical cost of low back pain

There is not relevant research done that links accurate cost with this pain, solely talking about low and middle-income areas around the globe. Usually the expenses caused by this pain are basically how work productivity is decreased and how expensive treatments and all medical care are. (Maniadakis N, Gray A, 2000, 95-103.)

There are also some other factors to take into consideration like transport and unofficial medical visits that are not registered in the systems of each country. By all this we can conclude that all this evidence is not 100 percent reliable since it does not take into consideration very important factors. However, the cost of LBP is most definitely in the same league as cancer, autoimmune sicknesses and cardiovascular problems. (Maniadakis N, Gray A, 2000, 95-103.)

This cost is just as big for individuals (not just at work or economically but also socially) as it is for countries, institutions, and governments and can affect work productivity a lot. (Maniadakis N, Gray A, 2000, 95-103).

About 5% of the population in the UK needs to be absent from work a big amount of time due to LBP. This is a huge problem because a huge amount of working days are lost, approximately 90 million days, and these tend to make the workers go to visit their GP, statistics say that around 8-12 million consultations are done per year. (Dunn KM, Croft PR Eura Medicophys, 2004, 9-13.) It is very important to notice that this information is just to give an image of how much money it can cost to a developed country having this LBP epidemic situation, in this case the United Kingdom. (Dunn KM, Croft PR Eura Medicophys, 2004, 9-13).

7 ICF MODEL

The World Health Organization created the ICF model, the acronym means International Classification of Functioning and Disability. This model went through a lot of testing in different areas of the world before its implementation. This model was created to see deeper into activity, functioning, participation and how the individual lives when he is affected by some injury or disease considering all external factors like ambient or personal stuff (Figure 1). The model itself has a very important standard language and definition of what are health and its connotations. (Website of WCPT.)

One of the most important aims of this model is to be able to compare information from different areas and countries. (Kisner and Colby 2012). This model has been approved by the UN, which helps the model to be carried out the way it should be in different countries and backgrounds, it even works as a tool of the implementation of international human rights when it comes to people with disabilities. (Website of WCPT.)

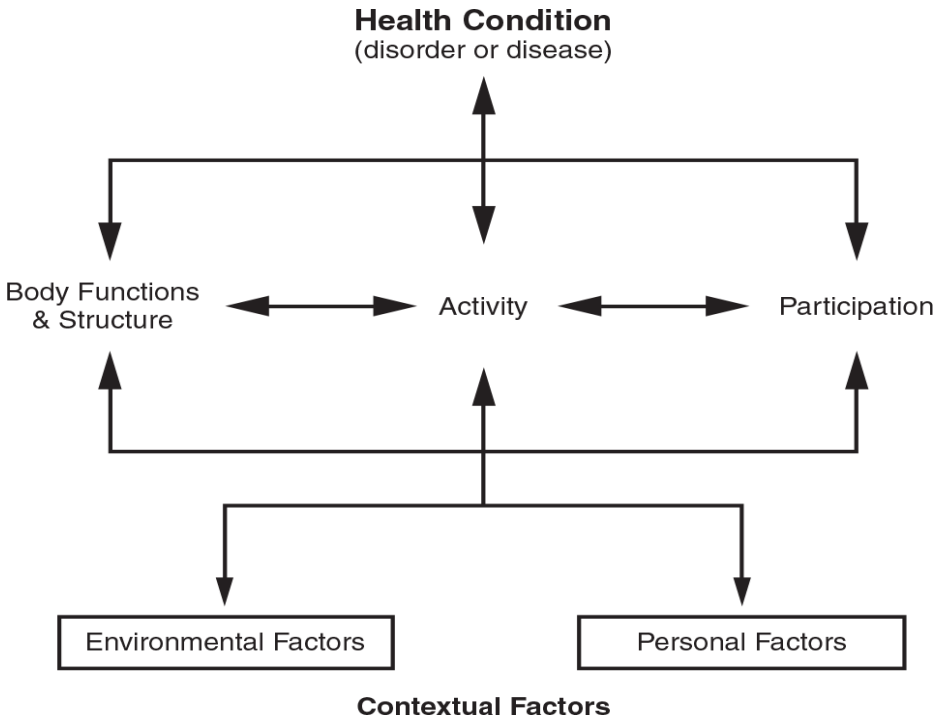


Figure 1. The ICF Model and how all the factors collide. (Kisner and Colby 2012).

The model´s content is basically an interaction of different factors and elements that are affected or affect a disability or problem in the individual´s body. How all these factors affect an individual´s life, activity and body needs to be understood by connecting all these factors so the model can be applied and used effectively. (Figure 1 and Table 2).

Table 2. Model´s components briefly explained. (Kisner and Colby 2012).

Body structures/functions	This means all the possible body parts, like organs and components, and physical areas that may be affected by the problem. This also includes psychological abilities.
Participation	How a life situation (sports or work) that the individual used to be involved in normally suddenly changed and is not really able to be carried it out anymore the same way as it was before.
Activities	In this area we see how difficult is for an individual to do something he used to do before normally like for example walking or running.
Environmental factors	Everything that is around the individual from social to physical, meaning the areas in where the individual lives and does all of his activities. It is important to remember that the ICF Model is neutral, so positive or negative points in the environment are both valid.
Personal factors	This term is left for the individual to decide by himself because it is basically how he perceives and experiences the impairments. This includes information like sex and age.

If a therapist would be having a client or patient complaining of NSCLBP, guidelines suggest appliance of the model. The model would end up looking like this if this was the case. (Figure 2.)

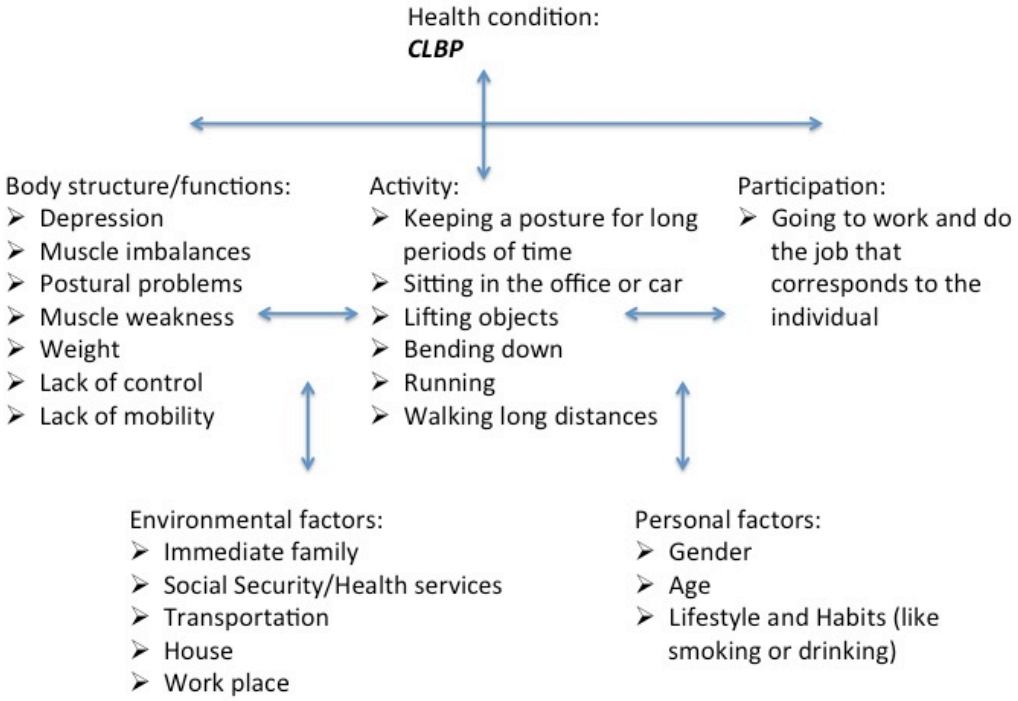


Figure 2. ICF Model explained with a NSCLBP patient example.

8 TREATMENTS AND INTERVENTIONS

There are two different paths a patient can take when experiencing CLBP and those two are conservative treatment or non-conservative treatment. Usually the recommended approach taken for this kind of problem would be conservative treatment and once this has not work or seems to be useless a non-conservative approach is suggested and taken if necessary. (Van Middelkoop et al, 2010.)

So far the best conservative treatments for CLBP are exercise therapy and patient education, which means that the patient or individual needs to perform a several

amount of exercises and movements that target the affected areas and enhance the overall general health and well being of the individual. The other area that is helpful and promising is the behavioral part of the treatment, which means that the therapist tries to target the cognitive and behavioral part of the individual or patient suffering from LBP and try to change or work on those that are causing problems. For example, learning how to relax and manage situations with good reactions in where a lot of pain is involved. The last but not least important part of treatment is the multidisciplinary approach. This approach is basically the intervention of different type of professionals to help different areas of the patient, which may include physical, psychological, social, etc. By all these factors different sources mean that the patient will need of a physiotherapist, GP, occupational therapist, psychologist and if necessary a pharmacist. (Van Middelkoop et al, 2010.)

As physiotherapists it is important to know what kind of physical exercise we should be giving as treatment to the patients with CLBP. The physical exercise treatment each patient gets totally depends on the needs of the individuals, however there is quite good evidence supporting the usage of strength training, aerobic exercise and core activation training. Guiding the patient is extremely important and developing the program with the patient during the process of rehabilitation is key to reach a better point when it comes to decreasing chronic pain. Incredible results have been seen with therapeutic exercise, which is basically giving a dosage of certain exercise. The dosage tends to be usually around 10 reps in each series and 2 to 3 series per muscle group exercised. (Website of Käypä hoito 2017.) Motivating the clients and making them feel safe when performing their physiotherapeutic programs or in their daily routine is of huge importance, because without these two elements treatments turn useless and recovery therefore much slower and with risks of developing more problems. (Kleinert J, Ott I, Mierswa T et al. 2017).

The use of alternative medicines like acupuncture, stress management, relaxation sessions even specialized massages for the low back can be beneficial in healing or calming CLBP. These alternative treatments tend to be secondary and do not have the best results in researches. Patient education along all these elements of treatment will always be moderate to strong supporting evidence specially when using this with therapeutic exercise increasing its positive results. (Website of Käypä hoito 2017.)

9 PREVENTION

Even though there is a vast amount of treatments and assessments for chronic low back pain, prevention is what we need to look for as health professionals and stop focusing so much in fixing an individual. A lot of people talk about prevention mostly in a ergonomically point of view or about the usage of special chairs or belts for prevention but articles done regarding these topics have shown little and weak evidence to support a strong evidence based prevention. (Steffens D, Maher CG, Pereira LS. 2013, 199-208.)

Another way of seeing prevention would be in a primary, secondary and tertiary set up. Primary would focus on avoiding a disease or problem appearing, in this case NSCLBP by educating about a healthy lifestyle in general. In secondary prevention professionals focus more in reducing the problems NSCLBP may be causing and therefore getting rid of pain and problems, in some point, by modifying habits that were creating an unhealthy lifestyle by having more regular screenings or tests. In the tertiary section focusing in how to manage and cope with chronic diseases, like depression or anxiety, or problems is key for recovery by helping the clients get rehabilitation programs and possibly motivational groups for support. (Institute for Work and Health Website.)

In 2016 a systematic review found out in a population of over aged people (18 and plus) that physical activity and some education could be very beneficial when it comes to prevent pain in the low back. This evidence was not of the highest standards but average to good caliber evidence, which made the authors feel like it was something positive and helpful but not definitive. They also found out those ergonomical programs, insoles, belts and just giving information and education to the workers alone was not enough and that the evidence was of low standards when it came to prevention. It is important to note that exercise and education together came out as the best evidence; applying just one of these two elements is not good enough

and shows very low quality evidence in the research done. (Steffens D, Maher CG, Pereira LS. 2013, 199-208.)

As exercise it is important to make emphasis in strength training and aerobic exercise, these two being the best preventive factors known to these days not only for people with low back pain but also for other comorbidities. Strength training will help mostly the muscles get stronger and more reliable and aerobic exercise will surely enhance the mental part and the musculoskeletal system as well. (Lauersen JB, Bertelsen DM, Andersen LB. 2014.)

Similarly to the treatment section, CLBP prevention is based the best in patient education and physical exercise. Kisner and Colby explain that patient education is basic when it comes to treatment and prevention, because the patient then learns what he should work on and what is wrong with him or her. The next step is enhancing our physical, psychological and behavioral areas that have deficiencies by working on them and at the same time learning about them. As mentioned before, NSCLBP is strongly tied to level of motivation, coping skills and self-efficacy. These are also parts patient education that need to be always addressed, by doing this patients can feel safe and have a better understanding of their fears helping them carry out their treatments and daily life activities, thus prevention of chronic pain can be reached. (Kleinert J, Ott I, Mierswa T et al. 2017; Kisner & Colby, 2012.)

As prevention we can find some data mentioning education, which means teaching the clients or individuals to learn how to breathe to develop a better and stronger core. It is also very important to understand your body and develop the wished body awareness everybody needs. Another tip for prevention is keeping a healthy lifestyle, which means keeping a balanced diet, doing physical activity, not being obese and not smoking. When we do this we help our back by not letting it take so much stress and many solicitations in its different structures. Keeping a good weight and not smoking is seriously important, so all the structures are healthy and get all the desired nutrition they need, meaning that they do not get affected by problems like diabetes, excess of fat or lack in movement in the tissues. (Spine Surgery Website.)

When healthy lifestyle is mentioned, clinicians and people in general tend to forget the mental part of the affected individual. Being healthy also means being depression free and having a good self-stem. It is crucial to attack depression or screen patients looking for pathologies in their low back, because it has been seen in many studies how individuals with depression complain of more intense pain in the area. Attacking these mentioned problems are a key factor of prevention of CLBP. (Matsudaira K, Kawaguchi M, Isomura T, Inuzuka K, Koga T, Miyoshi K, 2015.)

It is important to learn how to lift properly heavy and light objects. Avoiding twisting is such an important thing to avoid developing some stress related injuries or pain, especially the older we get. This relates to the last paragraph in where body awareness is mentioned and also knowing your body and its limitations. (Website of Spine Surgery 2013).

It has been seen in several researches that having lumbar support is not better in any way than doing exercise or being educated right, however researchers comment that it does may have some benefits when applied with education to reduce the amount of days a worker is out of the office, because it may make the patients feel safer, thus making them get rid of thoughts full of fear. There is quite a lot of conflict between researchers opinions regarding the real preventive outcomes a lumbar support may give to an individual, but most of the data collected suggests that there is not real benefit in prevention really seen or proved yet. (van Duijvenbode IC, Jellema P, van Poppel MN, van Tulder MW. 2008.)

10 PRODUCT

10.1 Informative video clip

Teaching is changing, with all the technology found teaching has relied lately a lot in different ways of creating and showing content to an audience or person and not just in the typical face to face, listen to the teacher method. People nowadays are required to learn faster and more efficiently than ever before. Networks and technologies have made learning much easier, more flexible and more entertaining. Knowledge clips or videos are a very effective way at the time of conducting a thesis, because it has the ability to reach people individually or in groups and it is the most flexible option for learning. (Dongsong Z et al. 2004, 75-79.)

The video needs to be concise and have brief information to keep the length under 3 minutes. The information needs to be entertaining enough to the viewer and it has to deliver the message the most effective way possible by using different element like voice tone, energy, language and images. (Brame 2015.) The elements mentioned need to be adapted to the audience the video is trying to reach so this can be effective. In this case prevention of NSCLBP in office workers, making emphasize on motivation, exercise and patient education. (Website of Käypä hoito 2017.)

11 DICUSSION

The topic was a mere personal choice, specially since chronic pain in general had always been such an interesting topic to read because of it consequences, how cultures and social roles affect it and the reasons that could be behind it. The mechanisms of low back pain are still not 100% known or identifiable yet in every single individual suffering from it, so as a physiotherapist it is really important to be as updated as possible at all times. Prevention was something that really grabbed my attention by reading and seeing a lot that even though people seem to “know” how to prevent having injuries (stretching, not lifting heavy objects, etc.) CLBP has just in-

creased during the last decades and now it is the biggest reason of absence at work, e.g. office workers, so teaching and pointing out the most relevant information found to teach the clients what real prevention is really interested me.

As a first task I needed to narrow the topic and check if there was any information available for the particular group I was going to talk about (office workers). Luckily there is a huge amount of information about NSCLBP and SCLBP, this really helped at the moment of making a choice. There were of course some limitations during the time of gathering data, like when trying to read brand new articles that needed to be bought or asked personally from the author.

I found very interesting and sometimes troublesome that countries with low income and different culture have different ways of addressing this problem, in some cases, than in high-income countries. This situation made me struggle in what information I should gather, but at the end I decided to talk more in a high-income country mind-set basing my thesis a lot in European research.

As a later duty was creating the informative video, which was quite a difficult task for me, but in my opinion it is a great way of getting people involved and more interested. The new way society lives in is by being connected to their phones and to creative content found in the media, these factors make an informative (short) video clip very effective when it comes to delivering a message.

In the future, research should really keep looking for elements that can prevent low back pain from appearing and also how to eradicate it when it has already made its appearance. I liked that motivation for exercise is mentioned in some articles and also factors like teaching the clients that depression and self-stem can have a huge deal in the chronification of pain. Another educational thing health professionals need to change that I think could be crucial when it comes to prevention is the extreme focus of people in ergonomics, postures, belts and/or correct technique of lifting stuff for low back pain prevention, specially CLBP. That knowledge should change and focus more in physical activity, motivation, mental/psychosocial factors and carrying out what the physio or health professional suggests.

To develop this thesis I would suggest having a group of office workers with low back pain. Furthermore I would try to give them a strength-training program for certain duration of time and see the results. As an addition, I would really focus in motivating the clients a lot, especially if they live a sedentary life or they are not really used to physical activity and see the results.

I would also suggest focusing in one world area and not so much in specific chronic low back pain. I would suggest having already guidelines or articles of prevention and treatments of Non-specific chronic low back pain and knowing very well what group you want to study.

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APPENDIX 1

STYLES USED IN THIS LAYOUT MODEL

Normal (Normaali)	body of the text, Times New Roman or Arial, font size 12, spacing 1.5, margin justifications on both sides, hyphenation
Abstract	text in the abstract font size 12, single spacing, margin justifications on both sides, hyphenation
Cover page	text on the cover page font size 14, Arial, centred
Heading1 (Otsikko1)	main headings font size 14, uppercase letters
Heading2 (Otsikko2)	headings font size 12
Heading3 (Otsikko3)	subheadings font size 12
Heading Appendix	heading APPENDIX 1, APPENDIX 2 etc. in the top right corner, font size 14, uppercase letters, align right
Heading Contents	heading CONTENTS, font size 14, uppercase letters
Heading References without Numbering	heading REFERENCES, font size 14, uppercase letters
List of References	Mention literature and other sources here, font size 12, single spacing
Table and Figure Captions	Place the table heading above the table and the figure heading below the figure, font size 12, single spacing

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