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Physiotherapy in Sinding-Larsen-Johansson

DEGREE PROGRAMME IN PHYSIOTHERAPY

2022

Author(s)	Type of Publication	Date
Rajahalme, Alfons	Bachelor's thesis	November 2022
	Number of pages	Language of publication:
	28	English

Title of publication

Physiotherapy in Sinding-Larsen-Johansson

Degree Programme

Physiotherapy

Abstract

The objective of this thesis was to increase the knowledge on the Sinding-Larsen-Johansson knee pathology that happens in adolescents. Another objective was to recognise and inform the differences between other pathologies similar to that of Sinding-Larsen-Johansson.

At first a plan was made regarding the timeline and ideas of this thesis, once this was accepted and the green light was given to start the writing process, the first step was to find information about the pathology, come up with the headings and then to apply the found information into the thesis itself.

A narrative literature review was performed to support this concept. The goal was to compile factual data on what role physiotherapy plays in the treatment of Sinding-Larsen-Johansson. A systematized approach has been used to provide a more thorough examination and lessen the possibility of any bias.

The results show that in combination with rest conservative treatment is important. To stretch and strengthen the surrounding areas of the kneecap is important when it comes to preventative manners and treatment of the pathology itself. Results mention that surgical treatment should only be done as a last resort treatment, but without neglecting conservative treatment alongside the operational treatment.

Keywords

Sinding-Larsen-Johansson, Physiotherapy, Conservative treatment

CONTENTS

1 INTRODUCTION

This thesis will go over the topic regarding Sinding-Larsen-Johansson (SLJ) syndrome, what it is, how it's treated, comparisons between similar pathologies and the surgical and non-surgical treatment and also including the prevalence of this syndrome.

The author has picked this topic, since this is not a topic which is much mentioned in pediatric course, even though it is heavily linked with other similar pathologies. It is only briefly mentioned on occasions, but not taught about. This pediatric syndrome is often mixed up with other similar pathologies and the author would like to increase the knowledge on this topic and thus potentially influence those clients going through this, as well as physiotherapists needing to deal with this.

What is Sinding-Larsen-Johansson? Sinding-Larsen-Johansson syndrome is a rare pediatric syndrome that has no prevalence mentioned about it. (RESERVED, 2016) . SLJ is a syndrome which happens to occur in children and in preteens, mostly in their growing ages. SLJ is most common between the ages of 10 – 15 year since the pathology is related to kneecap develops between these ages (Fischer, 2021). Kids with Cerebral Palsy (CP) are prone to having the Sinding-Larsen-Johansson syndrome (Gaillard, 2009)

Sinding-Larsen-Johansson got its start at a convention held in Helsinki Finland in the year of 1921. On the third day of the Northern Orthopaedic Association a Swedish surgeon Sven Christian Johansson reported finding similar to Christian Magnus Falsen Sinding-Larsen which then became the Sinding-Larsen-Johansson syndrome (Vanhoenacker & Pedersen, 2020).

Sinding-Larsen-Johansson syndrome is a syndrome in the bottom of the kneecap. SLJ is caused by irritation and swelling of the growth plate in the bottom of the patella, which occurs when there is repeated stress on the kneecap growth plate. SLJ typically

stops when the growth ends and most often doesn't have long lasting problems. (Sinding-Larsen-Johansson Syndrome for Teens - Nemours Kidshealth, 2019)

This thesis includes a theoretical background of the Syndrome, factors affecting the syndrome and information about tools and methods that physiotherapists can use to assess and treat this syndrome. This thesis will be based on literature found mainly from the internet, use of guidelines and books

2 AIMS AND OBJECTIVES

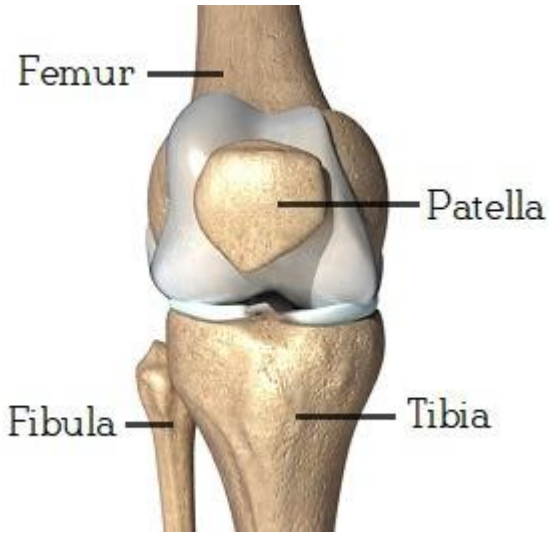
The aim for this Thesis is to increase the readers knowledge and provide a deeper understanding on Sinding-Larsen-Syndrome, the anatomy related to it, its treatment methods and the physiotherapy behind it. The objective is to do a narrative literature review about how physiotherapy treats and prevents Sinding-Larsen-Syndrome and giving the reader evidence-based knowledge regarding the topic.

3 ANATOMY

3.1 Knee joint anatomy

Because the topic covers a pediatric knee syndrome ("Sinding-Larsen-Johansson Syndrome," 2022),understanding the anatomy of the knee is very important since the knee is a very complex structure with loads of different areas and functions (Hirschmann & Müller, 2015). The knee joint is the largest joint in the human body (Zinovy Meyler, DO, 2017). The knee joint is constructed of 4 different bones and several ligaments and muscles. As seen below in picture one the bony structures of the knee,

the four bones in the knee consist of the Femur (thigh bone), the Tibia and Fibula (shin bones) and the Patella or in other words the kneecap. (A M R Agur & Dalley, 2013). The knee joint is one of the most complicated structures that there is in the human anatomical structure, due to this the author wants to talk about the main structures included in the SLJ syndrome. The knee joint moves in only 1 plane meaning it is a uniaxial hinge joint. The movement of the knee happens through 3 different joints, the tibiofemoral joint, the meniscus, and the patellofemoral joint. . (Tortora & Derrickson, 2017, pp. 247-250.)

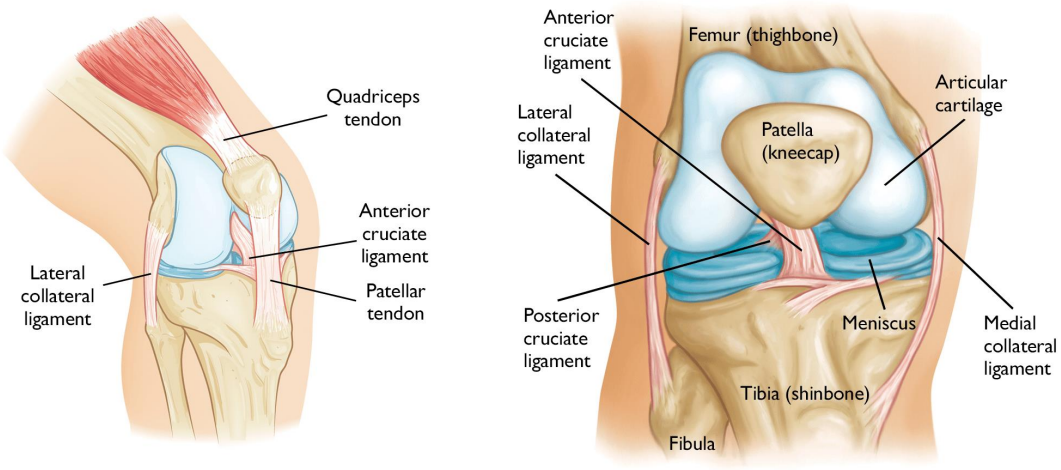


Picture 1. The bony structures of the knee joint (Wilson, 2011)

3.2 Muscles, tendons, and ligaments

The knee joint is surrounded by several muscles which all have their own role in the knees functioning. Some muscles are for the stability of the knee and others for power production. (Tortora & Derrickson, 2017, pp. 340-346.). There are several other muscles also that affect the knee in locations such as the foot and the hip (Svoboda, Janura, Kutilek, & Janurova, 2016). The quadricep muscle alongside the hamstring muscle and the gracillis are the three above the knee, and then there are the gastrocnemius, soleus and the plantaris which are all located under the knee. (Tortora & Derrickson, 2017, pp.341-342.). The picture 2. Tendons and ligaments showcases

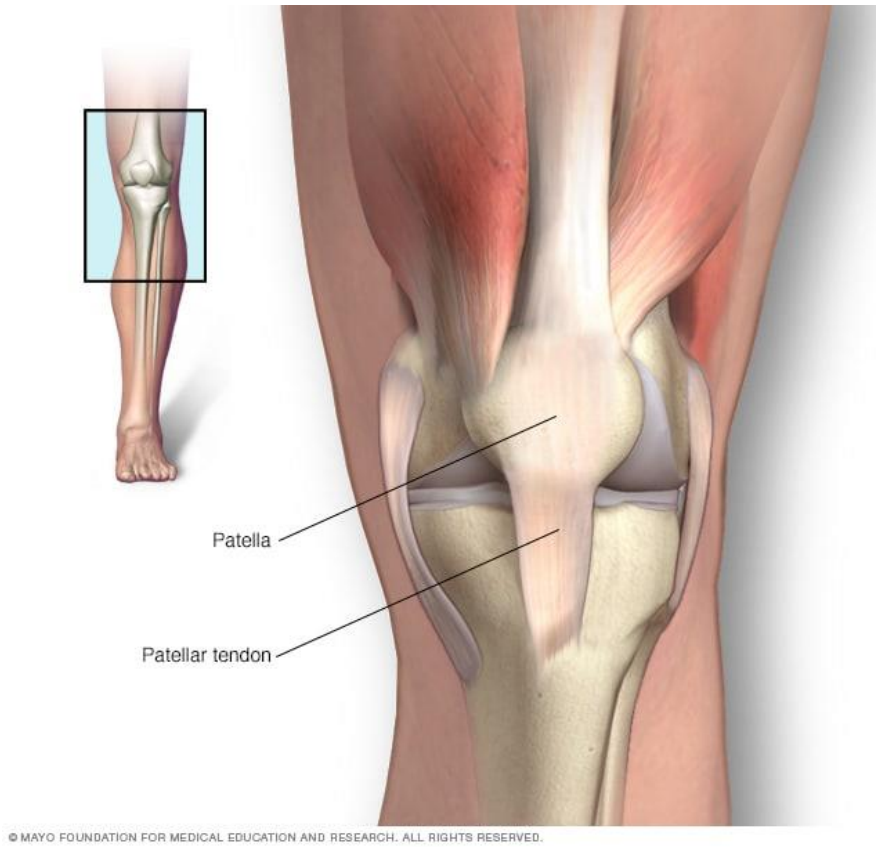
the tendons and ligaments of the knee which are mentioned in this chapter. Tendons work as connectors between muscles and bones, and ligaments as bone to bone. The tendons and ligaments consist of the patellar tendon, which connects the quadricep to the patella, the cruciate ligaments (medial, lateral, anterior, and posterior) (Niccoli et al., 2017)



Picture 2. Tendons and ligaments (Mulcahey, 2014)

3.3 Anatomy relevant to Sinding-Larsen-Johansson syndrome

The anatomy relevant to the SLJ syndrome consists of the Patella and the patellar tendon The picture 3 which is shown below, shows the kneecap and the patellar tendon, which are the main parts of SLJ. The kneecap and Patellar tendon are relevant since the pain is located in the bottom of the patella, on the patellar tendon (Valentino et al., 2012).



Picture 3. Anatomy relevant to SLJ syndrome (Mayo Clinic, 2018)

4 SINDING-LARSEN-JOHANSSON

4.1 What Sinding-Larsen-Johansson syndrome is

The Sinding-Larsen-Johansson syndrome (SLJ) is an overuse syndrome stemming from the patellar tendon on to the lower pole of the patella. It is characterized as pain that increases once there is more load on the patella during functional limitation, flexion, and sub-patellar swelling. (Valentino et al., 2012). SLJ is part of the diseases that belong in the osteochondritis group (López-Alameda et al., 2012). Osteochondritis is a joint disorder, that has no single factor accounting to it and is classified as a

disturbance in the endochondral ossification (Ytrehus et al., 2007). The endochondral ossification put into simple words means that the cartilage is being replaced by the bone that is being built while growing up (Science Direct, 2011). SLJ disease is a functional impairment lead by swelling in the knee of adolescents without previous traumas that are in a rapid growing phase. SLJ will have swelling localized in the upper part of the patellar tendon which including the pain and the given age/activity factors is a common sign of SLJ. (López-Alameda et al., 2012)

4.2 Symptoms

The symptoms of SLJ-syndrome start as pain at the top of the Patellar tendon right under the Patella when practicing movements such as running, jumping, kneeling walking up the stairs (Klucinec, 2001, 174-181). There is tenderness on the inferior pole of the patella when touched and resisted knee extension can cause increased pain alongside swelling in the tissue (Schleihauf, 2021). Inflammation-related signs that affect the knees' function. (López-Alameda et al., 2012)

4.3 Radiographical signs of Sinding-Larsen-Johansson Syndrome

Based on research done by (De Flaviis et al., 1989) in 45 out of 45 patients, ultrasound was as or more effective than in a regular x-ray scan. It is suggested that ultrasonography be used to diagnose osteochondrosis of the knee joint. The ultrasound image is also appropriate for routinely monitoring the disease's progression. (De Flaviis et al., 1989). Early results are ambiguous or nonexistent. Along with probable stranding of the nearby parts of Hoffa's fat pad, a thickening of the proximal patellar tendon may be observed. At some point, dystrophic calcification and/or ossification may take place as seen on picture 4. (Mohammadtaghi Niknejad, 2022).

Picture 4. X-ray of SLJ in knee (Mohammadtaghi Niknejad, 2022).

5 DIFFERENCE BETWEEN SINDING-LARSEN-JOHANSSON AND OTHER SIMILAR PATHOLOGIES

5.1 Osgood Schlatter

The pathogenesis between these two syndromes is very similar. They are both the result of excessive force that has been applied to the patellar tendon and more specifically on the lower part of the patella and they can even occur at the same time (Valentino et al., 2012). Both syndromes happen to be pediatric syndromes. The difference comes in the location of the pain SLJ is found on the lower pole of the patella, (Valentino et al., 2012). whereas the pain in Osgood Schlatter is on the tibial tuberosity (Weiler et al., 2011). The locational differences of these two pathologies can be found in picture five which is presented below.

Picture 5. Pain locations in SLJ and OSG (Truong, 2021).

5.2 Runner's Knee

The Runner's Knee pathology has similar symptoms as SLJ and can be found in the same location, in the area between the kneecap and the thigh bone. Runner's knee or is also known as Patellofemoral Pain Syndrome (PFPS). Since SLJ is a pediatric syndrome, PFPS can occur in anyone, but is most common in adults that do such as jogging, cycling, and mountaineering (Patellofemoral Pain Syndrome (Runner's Knee): Overview, 2020) A study mentions that PFPS is more common in young woman without any structure changes, whereas SLJ is due to structural changes (Petersen et al., 2013).

5.3 Jumper's knee

Jumper's knee is also known as patellar or quadriceps tendon tendinitis which falls into the same category as the other similar pathologies to SLJ and SLJ itself. Historical findings show that this is pathology which is found at the bone-tendon junction. The treatment for Jumper's knee starts as conservative but is not always successful. According to a study, 18 knees which presented the Jumper's knee pathology were operated on due to unsuccessful treatment when done conservatively. Operation on 11 out of 18 knees were successful and managed to return to their desired sport at the highest possible functionality. (Ferretti, 2016). The similarities to SLJ consists of the pain being located in the patellar tendon and the cause of the injury is an overstrain injury in sports. Jumper's knee can be found at any age, but is most common from 15 onwards, and there is no evidence on a peak of this syndrome. (Knee, 2019).

6 TREATMENT METHODS

6.1 Conservative

There isn't enough clinically applicable research to base treatments on. However, load adjustment, musculotendinous rehabilitation, and intervention to enhance the limb's shock-absorbing capacity are among the therapy principles for patellar tendinopathy derived from clinical experience. (Cook et al., 2001). In conservative treatment for SLJ syndrome, the most important thing to do is get rid of the onset pain. Rest is done to achieve a pain free state, in which after it is easy to follow through with conservative treatment. Stretching certain areas, such as the calves, quadriceps and hamstrings can relieve tension at the affected area and further the healing process. Physical activity or anything aggravating the pain should be stopped until recovery is complete, since physical activity is an aggravator (Fischer, 2021, pp. 63–68).

It is important to include exercise addressing flexibility or strength concerns. Eccentric workouts and isokinetic strengthening should be part of the treatment plan. (Sinding-Larsen-Johansson Syndrome, 2021). Patients with anterior knee discomfort have shown benefits leading from stretches and proprioceptive muscle strengthening activities. (Clark, 2000). Exercises involving the open and closed kinetic chains can both increase strength and functionality. (Witvrouw et al., 2000). Patellofemoral discomfort decreased in patients who adhered to a 30-to-60-minute physical therapy intervention once a week for six weeks. (Crossley et al., 2002)

6.2 Operational

SLJ syndrome is a self-limiting disorder that rarely, if ever, requires surgical treatment. (Alassaf, 2018) In a study made by (Kajetanek et al., 2016) for a professional adult athlete the result of the surgery was successful. The client did not respond well to the approached conservative treatment and thus as a last resort required an arthroscopic surgery which helped him recover quickly and return to his sport. (Kajetanek et al., 2016

7 PHYSIOTHERAPY IN SINDING-LARSEN-JOHANSSON

7.1 Prevention

In prevention of SLJ it is important to focus on behavior modification, which focuses on educating the patients and their families about choices to make regarding a healthy lifestyle, as well as exercising strength and fitness conditioning. Behavior modification is important, since fitness levels have decreased, acute and chronic injuries have increased because of their level of activity whilst the knee not being able to handle such level. Increasing knowledge on a healthy lifestyle should be educated to all adolescents in order to prevent knee lesions. Nonspecific physical activity can be neuromuscular training (NMT) which helps stimulate muscles in movement. NMT has shown to reduce ACL tears in female footballers and knee pain issues within adolescent females. (Lipman & John, 2015)

7.2 Physiotherapeutical treatment

Concerning SLJ, there is no established methodology or treatment regimen. Medication such as Non-steroidal anti-inflammatory drugs or (NSAID's) and In extreme circumstances, immobility is maintained using a cast. pain and activities are often used to guide treatment. If you are limping, crutches could be necessary. A skilled physical therapist or athletic trainer can help you recover and go back to your activity or sport. (Sinding-Larsen-Johansson Syndrome, 2021).
For individuals who are unresponsive to conservative treatment, surgical removal, which will remove the necrotic intratendinous tissue, should be the last choice. (Schleihauf, 2021). Since rest is the most important intervention to the SLJ syndrome the therapist's objective is to educate the patient on the reduction of activities and the amount of rest needed before returning to the activities. (Sinding-Larsen-Johansson

Syndrome, 2021). Activities requiring heavy load on the knee in flexion should be reduced or completely avoided in the beginning of treatment. These activities consist primarily of running, stair climbing jumping, squatting, and kneeling. (Sinding-Larsen-Johansson Syndrome, 2021). The treatment should be started by testing lower extremity strength in the hip and the ankle, since a lack of strength in these areas can cause muscle weakness and through this overuse of the knee is more likely (Klucinec, 2001, 174-181).

8 NARRATIVE LITERATURE REVIEW

8.1 The Narrative literature review

This thesis will be done as a narrative literature review. The research question, which the author will be using is How does physiotherapy effect in treating Sinding-Larsen-Johansson Syndrome. Several different databases, articles, books mainly found on google scholar will also be used. The author has chosen to use, keywords such as Sinding-Larsen-Johansson, Physiotherapy, Knee anatomy, Treatment in order to help in this topic.

The format of this thesis is a narrative review of the literature. A narrative or conventional literary review is among the most common styles of review. The knowledge base is summarized based upon a broad open question. This type of review typically follows the following format: a summary and evaluation of the research, judgments about the matter out from the literature, and then a discussion of any gaps or discrepancies in the data. In comparison to a systematic literature review, the methodology approach is much less well defined inside a narrative literature review. A technique where the sources are evaluated and chosen in accordance with standards is frequently included in a literature review. A transparent data gathering process is not necessary in a narrative literature review, making it difficult for the reader to assess the possibility of bias. However, at the academic university level, it is strongly en-

couraged to incorporate a methodical approach. The four main subcategories of narrative literature are as follows. The comprehensive literature review, a common sort of literature, enumerates the key components of the state of understanding on a certain topic. Reviews of the literature from a theoretical perspective focus at how theories are impacting the research. The strategy used in each of the included research is examined in the methodological literature, along with the benefits and drawbacks of each approach. (Aveyard, 2010; Baker, 2016; Grant & Booth, 2009; Onwuegbuzie & Frels, 2016.)

8.2 The Inclusion and exclusion methods and data collection process

In order to answer the study topic, many criteria were used to collect the data for this thesis. The articles acquired must be released or updated between 2012 and 2022 in order to contain information from the most recent studies. Peer review was required, as well as English writing and access to the whole text. The testing should only use human participants. The research were to include information about Sinding-Larsen-Johansson syndrome. The inclusion and exclusion criteria can be seen below in tables 1 and 2

The inclusion consists of

- Year of data (2012-2022)
- Language of studies (English)
- Access to full text (Available)
- Peer reviewed (Yes)
- Articles contents (Main focus on Sinding-Larsen-Johansson)
- Sinding-Larsen-Johansson in the title of the research (Yes)

Table 1. Inclusion criteria

The exclusion consists of

- Year of data (Before 2012)
- Language of studies (Other than English)
- Access to full text (No)
- Peer reviewed (No)
- Article contents (Main focus not Sinding-Larsen-Johansson)
- Sinding-Larsen-Johansson in the title of the research (No)
- Not tested on animals

Table 2. Exclusion criteria

After a subject has been chosen and background research has been performed, finding a research question is typically the next step. The following stages and the rest of the procedure will move more smoothly with a clearly stated research question. The study topic will be used to identify significant concepts, which will then be recorded as search terms in the databases. To produce a more useful study, the search terms must be carefully considered. Sinding-Larsen-Johansson was used as search terms in this study. (Ferrari, 2015). Two distinct databases, Google Scholar, and PubMed were employed for this narrative literature review in order to optimize the relevance of the numerous articles that could be retrieved. The fact that these databases offer pertinent information for medical study was a deciding factor. At first with just the search “Sinding-Larsen-Johansson” on both databases, there was over 2 thousand searches in total, when combining both databases. When using inclusion/exclusion criteria mention above the results drop to 19. After the duplicates were also taken

away the results drop to 11. The next step was to read the abstracts of each 11 articles still remaining. After reading the abstracts of each 11 articles and eliminating those with irrelevant information there are 5 more articles remaining.

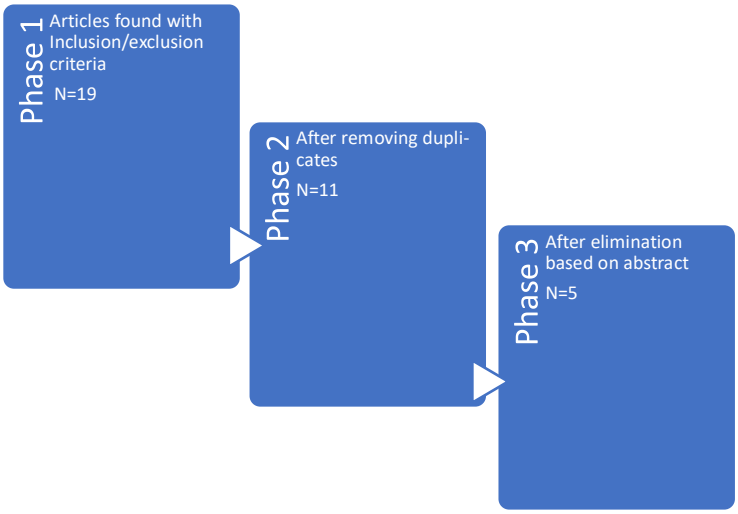


Figure 1. Summary of Article elimination

Authors of publication and year released	**Title of the remaining article**	**Study aims and objectives**	**Findings from the article**
Mohamad Azwan Aziz , Dayyinah Radzi, and Redzal Abu Hanifah (2020)	Case report: A rare case of Sinding-Larsen-Johansson syndrome in adult	Presenting detailed information on Sinding-Larsen-Johansson syndrome in an adult which was found after a traumatic injury in the sport	The patient had to go through intensive physiotherapy which included eccentric muscle strengthening exercises, which lead to total recovery and returning to his sport and improvement in knee stability.

Anastasia N. Fischer (2021)	Sinding-Larsen-Johnasson Syndrome	To give a short but thorough insight into Sinding-Larsen-Johansson	Pain relief is the main motivator, and nothing should be done before the pain levels allow more activity.
Axel Goldmann (2012)	Case Report: Sinding-Larsen-Johansson Disease	Insight on imaging results and treatment in this client specific case	When there is no trauma happened in the knee MRI scans are important in regard to concluding the pathology.
Nabil Alassaf (2018)	Acute presentation of Sinding-Larsen-Johansson disease simulating patella sleeve fracture: A case report	Raising awareness of the importance in the acute presentation of Sinding-Larsen-Johansson after a knee injury	The significance of incorporating SLJD in the differential diagnosis of sudden onset knee pain following an injury in teenagers is emphasized by this research. SLJD is a self-limiting condition that almost never necessitates surgical intervention.
C. Kajetanek, M. Thaunat, T. Guimaraes, O.Carnesecchi, M. Dagett, B. Sonnery-Cottet (2016)	Arthroscopic treatment of painful Sinding-Larsen-Johansson syndrome in a professional handball player	Explaining and going in depth on the arthroscopic treatment in Sinding-Larsen-Johansson	In extreme cases when all else does not work, arthroscopic treatment is available and does work, however this should only

			be done as the last resort and combined with physical therapy.

Table 3. Article summaries

9 RESULTS

These articles all mention the treatment of SLJ in one way or another. Depending on the age of the patient and the situation it is slightly different. All of then acknowledge that the normal case for SLJ is between the ages of 10-14. The article written by Anastasia N. Fischer 2021 which goes over SLJ in a short but thorough manner explains that rest is the absolute number 1 thing and that much shouldn't be done until the pain has gone, and that only once the pain is gone should the person go forwards with treatment related to their sport. The other articles also mention rest, but in a smaller effect, since they are more related to chronic SLJ or in rarer cases, such as adults with SLJ. All of the articles mention exercise one way or another, the article written by Mohamed Azwan et. Al in 2020. States that eccentric exercises for the hamstrings and quadriceps are crucial in the conservative treatment of the SLJ pathology. In Nabil Allasaf's 2018 article he puts the emphasis on load management but adds that exercising needs to be done alongside the load management, and that they work hand in hand with each other. In the article which goes over the operational treatment they mention that this is only done in rare occasions that warrant arthroscopic treatment. Healthcare professionals try to avoid operational treatment in SLJ until it is the last resort. Even when operational treatment is preformed, the emphasis on conservative treatment before and after is important. To only have surgery is not enough, whereas in most cases to not only do conservative treatment and no operation is enough. Based on the study that goes over imaging written by Axel Goldmann in 2012 when it comes to imaging, it is important to include MRI scans in the diagnosis of the SLJ-syndrome.

10 CONCLUSION

Based on the articles and the results of the articles, it can be concluded that rest alongside conservative treatment which consists of stretching and strengthening the hamstrings and quadriceps are extremely important when dealing with the Sinding-Larsen-Johansson pathology. Surgery should only be done as a last resort and even then, rest and conservative treatment should not be neglected. Surgery is not a quick fix without the other part of physiotherapy included.

11 THESIS PROCESS

The process of this thesis started around November 2021 when it was time to pick a topic. It was difficult to find a topic that not only was interesting, but to also have enough valid information about the topic. After a few meetings with teachers, the topic was chosen and the thesis started, by getting a plan accepted. Once the plan was accepted in January of 2022, the writing process itself could start. Before being able to start research had to be made and looked for. Until summer of 2022 there was not much progress regarding the writing of this thesis. While the author was on clinical placement, there was minimal time and energy to write the thesis. In the beginning of the 4th and final school year, August 2022 the writing got on to a very good path and progress was made. Together with meetings with the supervising teacher comments were given and the thesis was modified based on these corrections. The thesis was completed in the beginning of November and later that month presented and published.

This thesis will be done as a narrative literature review. The research question, which the author will be using is How does physiotherapy effect in treating Sinding-Larsen-Johansson Syndrome. Several different databases, articles, books mainly found on google scholar will also be used. The author has chosen to use, keywords such as Sinding-Larsen-Johansson, Physiotherapy, Knee anatomy, Treatment in order to help in this topic.

12 DISCUSSION

To come up with a topic and find the motivation to write about it was the biggest challenge for the author. The author had a few ideas initially, but nothing seemed to interest the author . The topic for this thesis was picked because it means a lot to the author due to personal experiences as a growing teen. The author was not sure how much information there would be about this topic. The author himself always got the same questions when mentioning that the author has Sinding-Larsen-Johansson syndrome. This question was always “oh so Osgood Schlatter ?” The author wanted to raise awareness for this syndrome and mention how SLJ can be handled and dealt with along with explaining the differences between similar pathologies.

The whole process of making the thesis had been a great learning experience and has most definitely supported the process of growing as a graduated physiotherapist stepping into the working life. This was the first real and proper experience for the author to have to collect, adapt and apply evidence-based information into a form of a thesis. When looking for and collecting the material required and needed for this thesis, there is surprisingly little material the author thought. A lot of the studies where combined with information on other pathologies and the author thought that this whole topic lacks a good bit of information.

Based on the authors previous experiences with SLJ the author already had an idea about the pathology and thus reading about the topic was at times easier due to a ready set base of knowledge on the topic. There was also a lot of new things that the author did not know yet, and the author was happy to see and learn these new things and feels much more educated on this topic in general. The strength of this thesis, in the author's perspective, is the theoretical background in the Sinding-Larsen-Johansson pathology. The weak point stands in the lack of research on this topic. The author would like to continue with this topic in order to find more information and grow this topic in regard to its research. Looking for the information was not a challenge, since there were a lot of databases available and information from several different countries and years which helps finding information

In conclusion the author grew while making this thesis and enjoyed the process more than expected and found it very useful for the authors learning experience and as growing as a researcher in the field of physiotherapy. The author believes that the learning experience will help educate further and will help stepping into the working life. Several things were difficult, but everything was overcome and complete to a satisfactory level of the author.

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