GÖTEBORGS UNIVERSITET

INSTITUTIONEN FÖR KOST-
OCH IDROTTSVETENSKAP

Could we use rate of perceived exertion for guiding isometric load in patellar tendinopathy?

Andreas Härdner Lennartsson

Kandidatuppsats 15 hp
Program Hälsopromotion
Vt 2020
Handledare: Stefan Lindinger
Examinator: Dan Fransson

GÖTEBORGS UNIVERSITET

INSTITUTIONEN FÖR KOST- OCH IDROTTSVETENSKAP

Kandidatuppsats 15 hp

Titel:	Could we use rate of perceived exertion for guiding load in patellar tendinopathy
Författare:	Andreas Härdner Lennartsson
Program:	Hälsopromotion
Nivå:	Bachelor
Handledare:	Stefan Lindinger
Examinator:	Dan Fransson
Antal sidor:	29 (inklusive bilagor)
Termin/år:	Vt2020
Nyckelord:	Isometric, Load management, Patellar tendinopathy, Rate of perceived exertion

Abstract

Patellar tendinopathy is a common and for some disabling problem resulting in an ended career or decreased physical activity, lower quality of life and health for elite- and recreational athletes. Isometric contraction has proven to be an effective way to decrease pain immediately after the intervention. In this study the possibility to guide load with rate of perceived exertion (RPE) during isometric contraction for optimal effect is investigated. In total five participants were recruited and performed the intervention. Borg CR10 scale was used to estimate pain and exertion pre- and post intervention. The result shows a weak trend towards increased pain when experiencing higher RPE. A bigger sample is needed to draw conclusions regarding the findings. The study results can be used to create new hypothesis's. More research is needed.

Sammanfattning

Patellar tendinpathy är en vanlig och för vissa ett handikappande besvär som tycks kunna avsluta karriären eller minska deltagande i fysisk aktivitet samt försämrad hälsa hos elit idrottare och motionärer. Isometrisk kontraktion har visat sig vara ett effektivt sätt minska smärta direkt efter interventionen. I denna studie undersöks möjligheten till att guida belastningen med RPE vid en isometrisk kontraktion för optimal effekt . Totalt fem deltagare rekrterades och genomförde interventionen. Borgs CR10 skala användes för att skatta smärta och ansträngning öre och efter interventionen. Resultaten visar på en svag trend för högre smärta när högre RPE upplevs. Ett större underlag behövs för att dra några slutsatser kring fynden. Studiens resultat kan användas för att skapa nya hypoteser. Mer forskning eftersöks.

Acknownledgement

First I would like to thank the department of food and nutrition and sport science for the possibility to write this thesis. I would also like to thank my supervisor Stefan Lindinger for his knowledge and support during this process. I would also like to thank Niklas Sposato for valuable advice and motivation during this process.
A special thanks to all the participants that took the time to make this thesis possible.

Table of contents

Introduction

Tendinopathy is a common disorder affecting both recreational- and elite athletes, which is reported to represent 30-50 % of all sports injuries (Abat, o.a., 2017; Florit, Pedret, Casals, Malliaras, & Sugimoto, 2019). Tendinopathy can lead to lack of physical activity, diminished work participation and a decreased quality of life (Fearon, o.a., 2014). Furthermore, the careers of professional athletes may be ended early as a consequence of lengthy periods of pain and dysfunction (Florit, Pedret, Casals, Malliaras, & Sugimoto, 2019).

Tendinopathy is an umbrella term that encompasses different tendinous disorders. According to Abat et al (2017) the most common tendon disorder is of a degenerative nature (tendinosis). The characteristics of degenerative tendinopathy are changes in cell-shape and numbers, disorganization and thinning of collagen fibers, increased amount of proteoglycans and water and vascular- and nerve ingrowth (Wang, 2006; Sharma & Maffulli, 2006; Abat, o.a., 2017; Magnusson & Kjaer, 2019).

Certain tendons seem to be more prone to develop tendinopathy, e.g. lateral epicondylitis in the upper limb and Achilles- and patellar tendinopathy in the lower limb (Abat, o.a., 2017). Patellar tendinopathy (PT) is mainly prevalent in sports were the athlete changes direction, accelerate and decelerate, jump and land with high frequency or combine these movements, e.g. volleyball, soccer or basket ball (Rio, Purdam, Girdwood, & Cook, 2017).

Exercise based rehabilitation has been the most important part of conservative treatment for PT during several decades (Abat, o.a., 2017; Lim & Wong, 2018; Cardoso, Pizzari, Kinsella, Hope, & Cook, 2019). Eccentric loading have been regarded as the “golden standard” of exercise-based rehabilitation during this time (Malliaras, Barton, Reeves, & Langberg, 2013; Abat, o.a., 2017).

Malliaras et al. (2013) points towards a potentially better outcome when incorporating concentric-eccentric loading instead of a mere eccentric loading regiment and Lim and Wong (2018) further conclude that all types of contractions reported favorable outcome in regards to pain and function.
In the latter review, isometric contractions were seen to reduce pain immediately after intervention (Lim & Wong, 2018). Rio et al. (2015) reported substantial reduction of pain in people with PT directly after an isometrically based intervention. The remarkable decrease in pain during the study by Rio et al. (2015) has not been reproduced (Rio, o.a., 2015; Rio, Purdam, Girdwood, & Cook, 2017; Holden, o.a., 2019). Riel et al. (2018) used the same isometric protocol on participants with plantar fasciopathy without any reduction of pain immediately after the intervention, Pearson et al. (2018) investigated an intervention based on two different protocols with isometric contraction and reported a decreased pain sensation

immediately after intervention and no significant difference between groups. Rio et al. (2017) used a protocol with 5*30 sec isometric hold, loaded with body weight in a Spanish squat, this also decreased the pain immediately after intervention (Rio, Purdam, Girdwoog, & Cook, 2019)
The large difference in outcome between different studies might arise because methodological issues in the studies by Rio, mainly concerning randomization, no control group, participant characteristics and sample size, but also that the intervention were not individualized to the participants. Malliaras et al. (2013) and Abat et al. (2017) points out that there is a lack of guidelines regarding optimal loading and intensity during rehabilitation of tendinopathy.

O´Sullivan, O´Sullivan and Gabbet. (2018) argue that the pain and fatigue experienced by the athlete could have similarities because they both are sensations influenced by the central nervous system, this could make the use of rate of perceived exertion (RPE) an interesting variable to evaluate when trying to optimize load during the rehabilitation in people with PT. The use of RPE is recommended in the clinical commentary by Silbernagel and Crossley (2015), they use the athlete's perceived exertion to monitor progression, loading and intensity of exercises during rehabilitation.

RPE provide a simple, valid and subjective method to measure the intensity (internal load) of an exercise ((Borg, 1998; Weston, Siegler, Bahnert, McBrien, & Lovell, 2015). The author of this study has not found any studies were RPE is used in a group of patients with PT to investigate the effect perceived exertion has on pain. Earlier studies have investigated RPE and pain in healthy participants during different loading and types of muscle contractions (Hollander, o.a., 2003; Hollander, o.a., 2008).

AIM

The aim of this pilot study is to investigate if the subjective experience (RPE) of an isometric load can be used to guide how rehabilitation should be individually loaded for the patient with PT to gain the best effect of the treatment. A secondary aim is to evaluate if it might be possible to do a full-scale study.

> **Research question:** Can subjective estimation of the load in an isometric intervention be a guide to optimize immediate pain reduction in people with patellar tendinopathy?
>
> **Hypothesis:** Those who report a higher RPE after a body weighted isometric intervention experience no reduction or increased pain immediately after.

Background

Tendons

Tendons are crucial for the function of the locomotor system where it transmits force from muscle to bone (Sharma & Maffulli, 2006; Wang, 2006; Bohm, Mersmann, & Arampatzis, 2015) and has the ability to absorb external forces and protecting the muscle from injury and increasing the efficiency of the locomotion (Sharma & Maffulli, 2006; Bohm, Mersmann, & Arampatzis, 2015).

The main components of tendons are collagen, proteoglycans, glycoproteins, water and cells (Wang, 2006). The main cell types seen in tendons are tenocytes and tenoblasts, which produce the components of the extracellular matrix. The fibroblast lies between the parallel fiber bundles of the collagen (Wang, 2006).

The tendon has a multi-level hierarchical apperence (Sharma & Maffulli, 2006; Wang, 2006). The smallest structural unit is the collagen fibril which consists of collagen molecules, tropocollagen (Wang, 2006). The fiber is composed of collagen fibrils, and is enclosed by the endotenon (Wang, 2006). The endotenon is a thin sheath of connective tissue that contains blood-, lymphatic’s vessles and nerves (Wang, 2006; Sharma & Maffulli, 2006). Collagen fibers form bundles of collagen called fascicles, all fascicles are surrounded by epitenon (Sharma & Maffulli, 2006). The epitenon is also a thin sheath of connective tissue (Wang, 2006). The different fascicles form the tendon and they are contained by the paratenon (Wang, 2006).

The tendon inserts to the bone via the periosteum or the actual bone (Wang, 2006).

Via deep recesses the tendon tissue is inserted to the muscle, this makes the muscletendonjunction (MTJ) the weakest part of the muscletendoncomplex (Sharma & Maffulli, 2006).

The structure of the tendon gives it viscoelastic properties and unique mechanical characteristics (Wang, 2006). The mechanical properties can be presented with a stress-strain curve that has three distinct areas, the toe region, the linear region and the failure region (Wang, 2006; Abat, o.a., 2017).

The toe region represents the stretching of the crimp-pattern seen in light microscope and equals 0-2% strain (Wang, 2006; Abat, o.a., 2017). The second area, the linear region, represents 4-8% of strain and micro failure may occur in the tendon (Wang, 2006; Abat, o.a., 2017). When the strain reaches 8-10% macro failure appears and more strain may cause rupture of the tendon (Wang, 2006; Abat, o.a., 2017).

Mechanical loading of the tendon stimulates the tendon cells to upregulate collagen synthesis (Magnusson & Kjaer, 2019). This upregulation of the collagen synthesis seems to be increased up to 24 h post exercise (Docking & Cook, How do tendons adapt? Going beyonnd tissue responses to understand positive adaption and pathology development: A narrative review, 2019). Changes in the mechanical, material and morphological properties are seen as an adaption to loading of the tendon (Bohm, Mersmann, & Arampatzis, 2015).

Recent studies do suggest that the tendon collagen structure consists of two different layers, one that is stable after adolescents (17 years of age) and one that has the ability to adapt to loading (Magnusson & Kjaer, 2019).

Eccentric contraction is suggested to be superior other types of contraction modes for tendon disorders, but according to a recent review no differences in outcome is seen (Magnusson & Kjaer, 2019). A few days without tensile loading will have detrimental effects to the mechanical properties of the tendon, reduced stiffness, down regulation of collagen synthesis, fibril disorganization but no larger differences in cross sectional area (Magnusson & Kjaer, 2019).

Tendinopathy

Tendinopathy is common among elite- and recreational athletes with negative effects on sport participation but also on work capacity and quality of life (Fearon, o.a., 2014; Albers, Zwerver, Diercks, Dekker, & Van den Akker-Scheek, 2016; (YFA), 2016). The incidence and prevalence of lower limb tendinopathy has been reported to be 11,83 and 10,52 per 1000 person and year (Albers, Zwerver, Diercks, Dekker, & Van den Akker-Scheek, 2016) and as many as 50% of injuries reported in sport medicine clinics may be represented by tendon disorders (Abat, o.a., 2017).

Tendinopathy is used as an umbrella term encompassing several different types of tendon disorders. There is consensus that the most common type of tendon disorder is degenerative in nature (tendinosis) (Abat, o.a., 2017).

Histologically, degenerative tendinopathy shows disorganized collagen fibrils, collagen thinning, increased number of cells, a change in cell morphology and a hypervascularization with associated nerve ingrowths (Sharma & Maffulli, 2006; Abat, o.a., 2017; Magnusson & Kjaer, 2019). The content of proteogycans, glycosaminoglycans is increased and this result in increased amount of water in the tendon followed by a larger cross sectional area (Magnusson & Kjaer, 2019). These changes within the tendon reduce the stiffness and could lower the strength of the tendon (Abat, o.a., 2017; Magnusson & Kjaer, 2019).

The development of tendinopathy is still an enigma, the most prevailing model is based on the cells response to load (Cardoso, Pizzari, Kinsella, Hope, & Cook, 2019). The tendon continuum model, presented by Cook and Purdam (2009) tries to describe in what way the tendon can be categorized in a spectrum of pathology.

Alterations in loading are considered to be a critical factor in the onset and development of tendinopathy and other risk factors will have an effect on the tendons tolerance to load (Abat, o.a., 2017).

Risk factors for tendinopathy would be dichotomized into internal (e.g. biomechanical and systemic) and external (e.g. load related) risk factors (Malliaras & O´Neill, 2017). Loads using the stretch shortening cycle seem to be related to the onset of tendinopathy, but changes in duration, intensity, frequency and rapidly increasing load is external risk factors predisposing for developing tendinopathy (Malliaras & O´Neill, 2017).

Internal risk factors could be affecting homeostasis in the tendon and the possibility to adapt to load which could predispose the tendon for tendinopathy, these factors could be age, obesity and diabetes (Kozlovskaia, Vlahovich, Ashton, & Hughes, 2017).

Tendinopathy is a clinical diagnosis that is characterized by pain and dysfunction in the tendon (Rio, o.a., 2014). There is still a lack in understanding about the nociceptive driver in tendinopathy and several theories exist (Sharma & Maffulli, 2006; Rio, o.a., 2014). One aspect that creates confusion is the poor correlation between pain and tissue changes seen in degenerative tendinopathy, many asymptomatic people show degenerative changes on MRI or ultrasound examination (Sharma & Maffulli, 2006; Rio, o.a., 2014).

The pain is load dependent and show no signs of spreading, these symptoms points towards a local nociceptive driver but studies has shown that changes in cortical inhibitory and excitatory motor output can occur in tendinopathy (Rio, o.a., 2014; Rio, o.a., 2015). It is most likely that several mechanisms and factors underlie the pain in tendinopathy, contemporary pain research also focus on contextual and cognitive factors in pain (Rio, o.a., 2014).

All tendons can develop tendinopathy, and depending on location, tendons will have different function and anatomy. Lower limb tendons store and release energy used in locomotion while upper limb tendons are not involved in locomotion and commonly affected by frictional forces (Scott, o.a., 2013). Lower limb tendinopathy have a incidence of 10,53 per 1000 persons in a Dutch general practice population and within this group PT is common (Albers, Zwerver, Diercks, Dekker, & Van den Akker-Scheek, 2016; Abat, o.a., 2017).

Patellar tendinopathy

In a epidemiological study on a dutch population in a general practice PT had the incidence rate and prevalence rate of 1,60 per 1000 person-years (Albers, Zwerver, Diercks, Dekker, & Van den Akker-Scheek, 2016) and in a study on five different sports at F.C. Barcelona over 8 years the incidence for patellar tendinopathy was 4,7% (n=181 tot 3839 athletes) and in professional basket almost 23% (22,7) (Florit, Pedret, Casals, Malliaras, & Sugimoto, 2019). Abat et al. (2017) report prevalence as high as 45% amongst volleyball players and 32% in basketball players (Abat, o.a., 2017).

This injury could potentially impair the career for athletes (Nuhmani & Muaidi, 2018). Risk factors are important to consider during tendon rehabilitation (Brukner, o.a., 2017), one of the main extrinsic risk factors for the development of PT is loading (frequency, volume and intensity) other relevant factors are training surface and equipment (Abat, o.a., 2017; Nuhmani & Muaidi, 2018).

Intrinsic risk factors could be related to biomechanics, decreased ankle range of motion, pes planus and limb length discrepancy (Nuhmani & Muaidi, 2018). Lower limb strength has been seen to be decreased with in people with PT (Abat, o.a., 2017; Nuhmani & Muaidi, 2018). It has been reported to be more prevalent in males (Nuhmani & Muaidi, 2018).

PT is considered a clinical diagnosis (Vander Doelen & Jelley, 2020). The most common presentation is pain at the inferior pool of the patella (65%-70%) (Abat, o.a., 2017; Nuhmani & Muaidi, 2018). The pain is provoked by loading of lower extremity (Vander Doelen & Jelley, 2020) and energy storing exercises like jumping, cutting or sprinting. (Nuhmani & Muaidi, 2018). It is also dose dependent and the pain commonly increases with higher intensity or duration of applied load (Malliaras, Cook, Purdam, & Rio, 2015). During the warm up the pain can be decreasing and it is often that the pain gets worse after the training session and even the day after intense training (Malliaras, Cook, Purdam, & Rio, 2015).

In some cases the pain can be provoked by being in positions with a flexed knee e.g. sitting in a chair, sitting on the knees (Malliaras, Cook, Purdam, & Rio, 2015). This is the typical clinical presentation among people with patellar tendinopathy.

Palpations of the tendon is suggested by some to be a reliable test (Holden, o.a., 2019), but arguments are being made that it has low specificity and sensitivity (Cook, Khan, Kiss, Purdam, & Griffiths, 2001).

The single leg decline squat (SLDS) could be recommended as an assessment for PT according to the study from Purdam et al. (2003). The SLDS is a squat exercise performed on a wedge with a 25 degree angle (Purdam, Cook, Hopper, Khan, & group, 2003)

The use of imaging is not essential in the initial stages because of the poor correlation between findings on different imaging modalities and pain (Rio, o.a., 2014; Malliaras, Cook, Purdam, & Rio, 2015).

Ultrasound (US) and magnetic resonance imaging (MRI) is considered the most appropriate modality for tendon imaging (Docking, Ooi, & Connell, 2015) and should therefore be used when the need for excluding different possible diagnoses (Malliaras, Cook, Purdam, & Rio, 2015). Because of the high cost and low availability of MRI, diagnostic US should be used during clinical examination if necessary (Abat, o.a., 2017).

Treatment patellar tendinopathy

Conservative treatment based on load monitoring and exercise is the recommended treatment for PT (Abat, o.a., 2017; Cardoso, Pizzari, Kinsella, Hope, & Cook, 2019). In a recent systematic review of treatment options for PT, surgery were recommended as a second line of treatment when conservative treatment failed after six month (Everhart, o.a., 2017).

Two types of surgical intervention are used according to the literature, open surgery and arthroscopic surgery (Everhart, o.a., 2017; Nuhmani & Muaidi, 2018). The evidence supports the use of surgery for cases of recalcitrant PT and the outcome for both techniques are in general the same with a post surgery rehabilitation time of three - nine month (Everhart, o.a., 2017; Nuhmani & Muaidi, 2018).

The literature reports several other options for treatment of PT, e.g. injection therapies using corticosteroids, autologous blood injection (ABI) or platelet rich plasma injections (PRP), the corticosteroids seems to have a good effect short term while ABI and PRP, despite the need for more studies, seems to have a positive effect on pain and function in PT (Nuhmani & Muaidi, 2018; Vander Doelen & Jelley, 2020).

Extracorporeal shockwave therapy (ESWT) is mentioned in the literature, but the efficiency of the treatment is debatable (Vander Doelen & Jelley, 2020).

Patellar strapping/taping could be used in the short term for pain modulation, potentially due to cutaneous stimulation (Vander Doelen & Jelley, 2020).

During the last two or three decades eccentric training has been considered the golden standard for PT treatment (Malliaras, Barton, Reeves, & Langberg, 2013; Abat, o.a., 2017), but as many as 45% of patients do not get a satisfying result from this type of loading (Malliaras, Barton, Reeves, & Langberg, 2013). In the more recent review Lim and Wong (2017) evaluates three different exercise modalities and their effect on pain and function.

The conclusion is that isometric contraction could be used in the short term for pain modulation and eccentric and heavy slow resistance (HSR) had better outcome in the long term (Lim & Wong, 2018).

This approach is also recommended by Malliarias, Cook, Purdam and Rio in the clinical commentary regarding PT (Malliaras, Cook, Purdam, & Rio, 2015). They suggest a four stage PT rehabilitation plan: stage 1, pain modulation via load management and isometric contraction; stage 2, isotonic loading with minimal pain (0-3 on numerical rate scale) for increasing muscle bulk and strength; stage 3, energy-storage loading, increase myotendinous load tolerance and to build power; stage 4, return to sport when full training is tolerated without symptom provocation (Malliaras, Cook, Purdam, & Rio, 2015).

The use of isometric contraction for immediate pain reduction in PT has exploded in 2015 after the article by Rio et al. (2015). This has then been criticized because of the heterogeneity of the effect (Gravare Silbernagel, Vincenzion, Skovdal Rathleff, & Thorborg, 2019).

Malliaras et al. (2013) concludes that eccentric and concentric loading should be used in PT rehabilitation and that more research regarding different load parameters is needed. This conclusion regarding load (intensity and dosages) for optimal outcome of the isometric contraction is also done by van Ark et al. (2015) and Holden et al. (2019).

Rate of perceived exertion (RPE)

Perceived exertion is the feeling how heavy and strenuous a physical task is (Borg, 1998). One thing that is important is how we choose to measure the perceived exertion. Gunnar Borg has presented the Borg RPE-scale and Borg CR10-scale as possible ways to rate the perceived exertion (Borg, 1998). Borg CR-10 scale is often used for pain but can also be applied to perceived exertion (Borg, 1998).

In most healthy subjects the focus is mainly on subjective aspects of stimulus intensity and the sensory experience of exercise. The perceived exertion is closely related to exercise intensity (Borg, 1998).

Several factors influence, motivational, emotional, and pathological or pain conditions, as well as traits of the person could affect this subjective experience of exertion (Borg, 1998). There are similarities between the experience of exertion, fatigue and pain in that they are all influenced by the central nervous system (Noakes, St Clair Gibson, & Lambert, 2005; Butler & Moseley, 2010; O´Sullivan, O´Sullivan, Gabbet, & Tim, 2018).

In a group of healthy males with resistance training experience RPE and pain seemed to follow a similar pattern, when RPE increased so did the sensation of pain (Hollander, o.a., 2003). Vaegter et al. (2019) noticed a significant correlation between exercise induced hypoalgesia (EIH) in the non exercising muscle and RPE during a 3 min wall squat. This was not the aim of the study but could indicate that higher RPE induces higher EIH in some cases (Vaegter, o.a., 2019).

Loading of the muscle rather than contraction type seem to play a bigger role in changes in perception in pain and effort (Hollander, o.a., 2008).

To adjust training to the individual and his/her performance is called autoregulation. It is indicated by the increasing amount of evidence that autoregulation of the training could be superior to a well designed training protocol (Greig, o.a., 2020). Autoregulation have been used in a rehabilitation setting since the 1940s and has since evolved (Greig, o.a., 2020). RPE is a beneficial and convenient tool to use for autoregulation (Kilpatrick, Newsome, Foster, Robertson, & Green, 2020).

RPE is recommended as a tool for monitoring the load experienced of the patient during tendinopathy rehabilitation (Grävare Silbernagel & Crossley, 2015). No studies support this recommendation that RPE can be used accurately in persons with PT.

Method

This study was conducted at the Ortopedmedicinska Institutet in Gothenburg. The study could be the basis for future studies.

Design

The study was an experimental pilot study and conducted in accordance to the declaration of Helsinki (World Medical Association, 2018). Pre- and post intervention measurements was performed to evaluate the possibilities to use subjective estimation (RPE) to guide loading during an isometric intervention to optimize reduction in pain in people with PT. The study was separated in to four steps:

1. Information and signing the consent form
2. pre-intervention examination and measurement
3. intervention
4. post-intervention measurement

Information regarding the aim and the different steps of the study were explained. The participant got the opportunity to get acquainted with the Borg CR10 scale and the author explained how it is used according to Borg for rating pain and exertion (Borg, 1998).
In step two the examination was conducted on the painful knee or the most painful knee if bilateral pain were reported. Participants that were found eligible performed a SLDS and were asked to rate the pain they experienced during the SLDS on the Borg CR10 scale.
The intervention in step three was based on the previous study by Rio et al. (2017), 5sets of 30 seconds isometric Spanish squat (fig 1.) with one-minute rest between sets.
A rigid belt (Tirante Musculador RF Barcelona) was used and placed round a steady base (fig 2.).
All participants did three test squats before starting the intervention to get familiarized with the execution of the Spanish squat.
Directly post intervention the participant rated the perceived exertion of the isometric intervention and a SLDS were conducted a second time and pain experienced during the SLDS was reported.

Fig1.Spanish squat

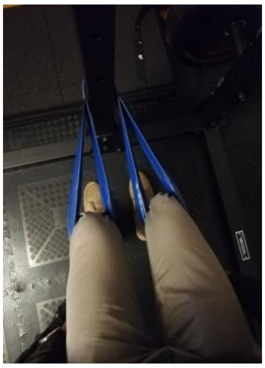

fig 2.placement of band

Sample

A total of five participants (two females) were recruited via a randomized and snowball selection. Participants were recruited via advertisement on social media during april – june 2020. Three advertisements were published during this time period and all were non paid advertisement and people seeing the advertisement was encouraged to share it.
Interested participants contacted the author and after this first contact they received person information and consent form (appendix 1) by mail.
Those interested were after this booked for examination and intervention.
The author examined all participants. Participants were eligible for the study if the following inclusion criteria were meet, age between 18-64, pain localized to the inferior pole of the patella at palpation and during jumping and landing activities and pain should be experienced during the provocative test, SLDS.
Paticipants were excluded if they had any concurrent knee pathologies (e.g. the presence of diffuse knee pain presentation), or previous knee surgery or had received corticosteroid injection within the previous six month.
Seven participants were examined. Two of them were excluded, one had not PT and one had a concurrent knee pain (Patellofemoral pain syndrome). Three showed interest and were booked for the intervention session but cancelled close to this session. One had not experienced pain since booking the session and two reported lack of time.
Two were interested but had geographical issues.
Two contacted the author and received the person information but did not reply after the initial contact.
Age, weight, length, physical activity and time with symptom were basic information about the participants that they had to report to the author. BMI was calculated by the author and this information is presented in table 1.

Table 1. Participants presentation, reported as median (range).

Participants n=5 (2 female)	
Age (years)	40 (26-52)
Weight (kg)	100 (58-118)
Length (cm)	174 (167-190)
BMI	31,6 (20,3-34,5)
Physical activity per week (h)	2,5 (0-10)
Time with pain (month)	36 (1,5-240)

Data collection

Data collection was made during April to June 2020. Each session took approximately 40 minutes and the lead author of this study collected all data in a excel sheet.
Anthropometric data and information about weekly physical activity and time with knee pain was collected previous to the examination and intervention. Pre intervention pain during the SLDS and post-intervention RPE and pain during the SLDS were reported.
The Borg CR10 scale was used for reporting both pain and RPE (appendix 2). It was translated into Swedish by the author and the original scale was also available to the participants when they reported pain or RPE to increase the understanding of the verbal anchors.
Borg et al. (1998) and Tibana et al. (2019) presents a larger categorization of the Borg CR10 scale, this is slightly modified from 4 groups (just noticeable, light, heavy and almost max) to 5 groups (just noticeable, light, heavy, very heavy and almost max) in this study to make categorization easier.
The RPE scale is categorized in to following groups in this study, 0-2 just noticeable, 3-4 light, 5-6 heavy, 7-8 very heavy and 9-10 almost max.

Data processing and analyze

The collected data was presented and analyzed with descriptive statistics. All data collected for each individual were processed separately and the change in experienced pain, pre- and post intervention were calculated and analyzed together with collected RPE.
To analyze the correlation between change in pain and RPE the correlation coefficient was calculated with the Spearman rho (r_s) in SPSS.

Methodological considerations

The study is designed as a experimental pilot study, no studies has research this question earlier.
The intervention in this study is based on the same intervention used in the study by Rio et al. (2017). This intervention does not demand any technical experience and is easy to explain and execute for the participants and is there for the best choice for this study. The intervention is also used in an earlier study and therefore data from this intervention scheme already exists (Rio, Purdam, Girdwood, & Cook, 2017).
To distinguish the effect of the intervention no warm up were done before the intervention. Several studies show that pain can be modulated by aerobic exercise because of its positive effects on exercise induced hypoalgesia (Naugle, Fillingim, & Riley, 2012) and one of the clinical features for tendinopathy is that can usually be better after warming up (Malliaras, Cook, Purdam, & Rio, 2015).
By reducing other interferences with the intervention, stronger conclusions could be drawn from the results. It is rare that isometric contraction of muscle cause rupture or any other serious injuries (Brukner, o.a., 2017).
In earlier studies participants in the age of 16-65 have been used. But people with less experience in training might have problem with categorizing the perceived exertion, either

giving really high or really low estimates. To minimize this potential source of error the age range of 18-65 was used.
The Borg scale is commonly used to scale RPE (Borg, 1998). But this is not used for pain. The Borg CR10 scale is validated for both pain and RPE and has similarities in the verbal cues (Borg, 1998).
The similarities that are seen in the Borg CR10 scale for pain and RPE makes it easier for the participants to understand how to use the scale.
Because of the pandemic that has been affecting the world during this spring and summer the guidelines from Folkhälsomyndigheten was followed to ensure minimal risk of spreading the infection.

Results

In total five participants (two females) were found eligible for the study and completed the intervention of 5*30 s isometric contraction. None needed to quite the intervention ahead of time.
The demographics of the participants are presented in table 1 as median (range).

The reported RPE and calculated change in pain is presented in figure 1.
Three participants experienced an increase in pain after the intervention. Participants in this group reported between 5 and 7 on the RPE scale. This perceived exertion could be categorized as being heavy to very heavy.
Two participants experienced a decrease in pain after the intervention. The participants in this group reported between 4 and 5 on the RPE scale. This perceived exertion could be categorized as being light to heavy.

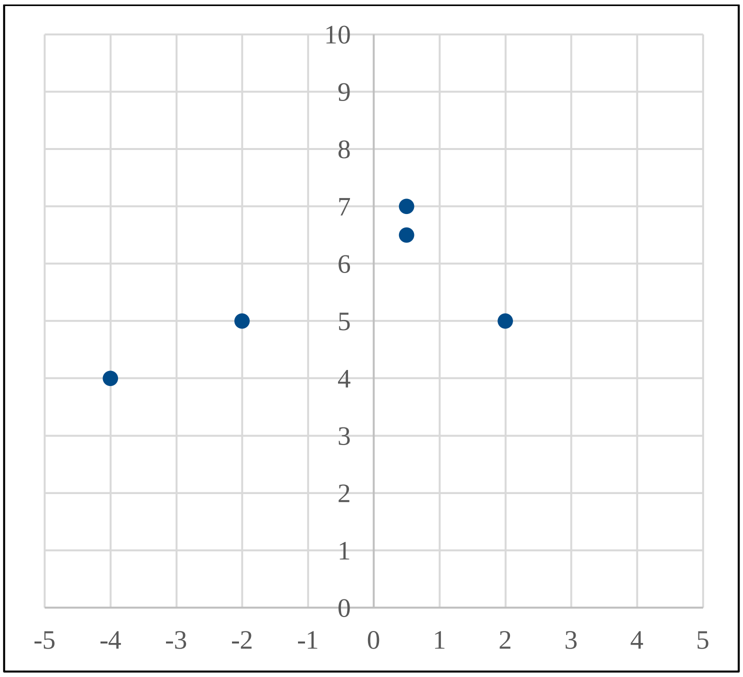

Figure 1. RPE and calculated change in pain for each participant

The participants that experienced immediate pain reduction was both male and they reported the highest pain during the SLDS pre-intervention and the lowest RPE for the intervention. They had been having pain for more than three month.

Three participants experienced increased pain after the intervention, two females and one male. They reported the lowest pain during the SLDS pre intervention and the highest RPE for the intervention. The two females had been having pain for less than three month and the male participant for more than three month.

RPE and pain pre- and post SLDS is reported individually for all participants is presented in figure 2.
The Spearman rho (r_s) correlation analysis of change in pain and RPE were calculated to (n=5; r=0,563; p=0,362).

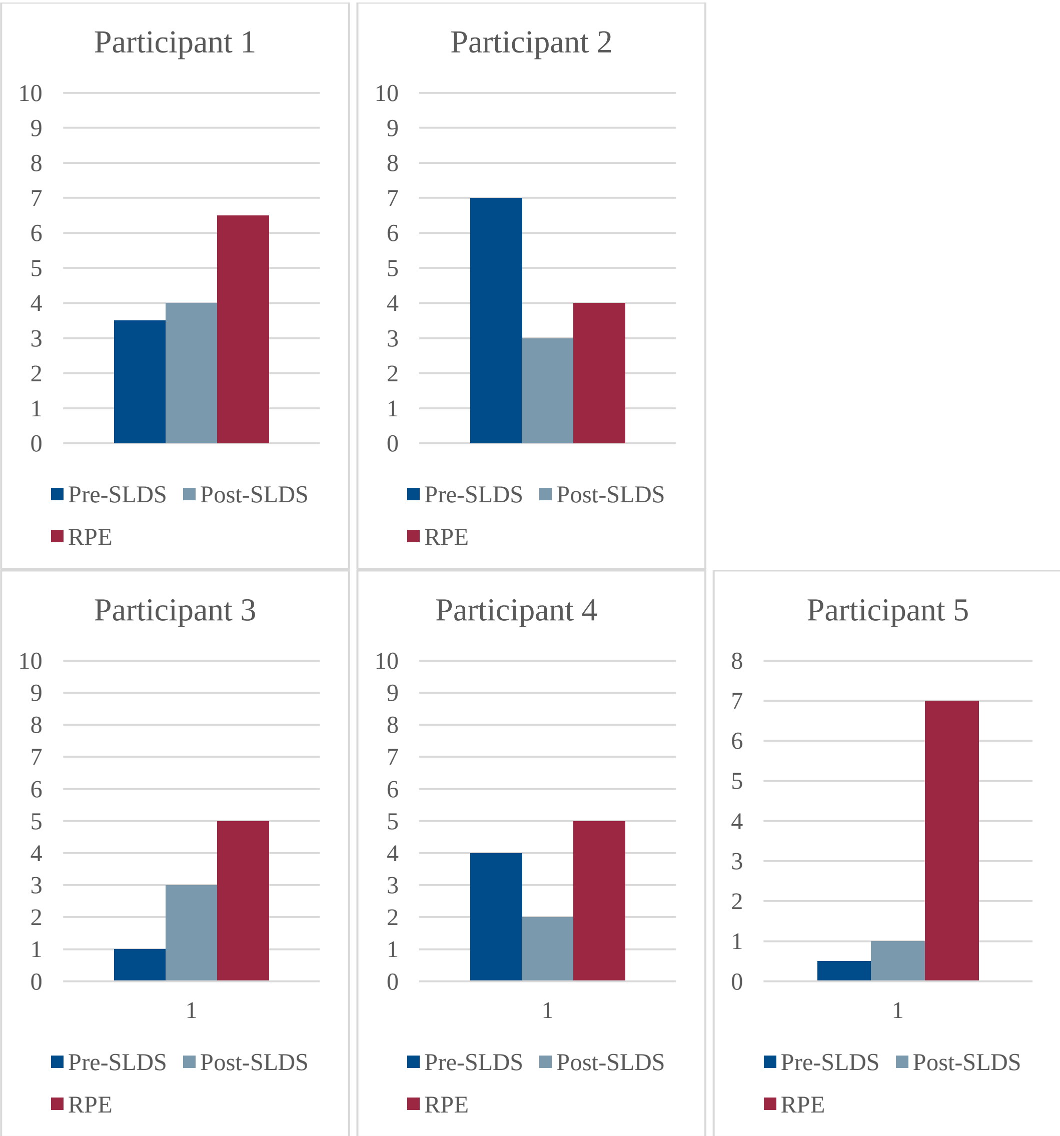

Figure 2. Pre- and post intervention pain during SLDS and experienced RPE for each participant

Discussion

Method discussion

The current study has several limitations that will affect the conclusions that can be drawn from it. The number of participants is very small and this will affect the possibility to generalize the results or draw any conclusions from the study. One major factor for the low numbers of participants is that the study was conducted during the corona pandemic. This made the recruitment of participants complicated. During the spring most sport clubs closed down their activities which affected recruiting negatively. In special subgroups the prevalence of PT is high (45% volleyball and 32% basketball), and not being able to recruit within these groups could have affected the sample size negatively (Abat, o.a., 2017).
Only using social media for recruiting participants could also have negatively affected the sample size, there is a risk missing people not using social media.
In total fourteen people showed interest but after several drop outs only 5 remained and participated in the study, this gives the study a high drop-out rate.

It was not possible do any statistical analysis due to the small sample size. With a larger sample size the conclusion could be more certain. A Spearman rho (r_s) correlation coefficient was calculated. If a larger sample size can be recruited in future studies more interesting analysis can be made with inferential statistics. Differences between known risk factors e.g. gender, age, BMI, physical activity, duration of symptoms and change in pain or RPE. Statistical analysis could then be done with Mann-Whitney U or Wilcoxon rank sum test (Ejlertsson, 2019)

The Borg RPE scale is the one most commonly used when scaling exertion in training and rehabilitation (Borg, 1998). In this study the CR10-scale was used, this is also reliable and valid (Borg, 1998), but not as known as the Borg RPE scale. The author translated the verbal anchors in the Borg CR10-scale to Swedish to make the use easier for the participants. The original verbal anchors were also used.
During the information part of the study the participants were able to see and get accustomed to the CR10 scale. Several of the participants did have a hard time rating both pain and RPE with the CR10 scale even if that information was repeated more than once. The inexperience of the participants in using Borg CR10 scale and the author to explain how to use the scale could have negative consequences for the reliability. Further sources of error could also be the author getting better in explaining how to use the scale and this will also affect reliability. Participants that have a low training experience may have trouble with rating the perceived exertion because they have not pushed them self so hard in training, this could affect the possibility to rate exertion.
The information where explained as suggested by Borg and in a neutral way to not affect the participant (Borg, 1998). A recent study suggest that exercise induced hypoalgesia (EIH) could be affected if the participant experienced the information as negative (Vaegter, Thingsgaard, Höj Madsen, Hasenbring, & Bloch Thorlund, 2020). Borg. (1998) describes that RPE could be reported in different ways, RPE-whole body, RPE-lungs or RPE-legs. This was

not clearly explained or defined in the information to the participants and because of this participants could have subjectively reported RPE in different ways. This would affect reliability in a negative way.

Earlier studies have used the inclusion criteria of the participants reporting minimum pain of two or three out of ten on a numerical rate scale (NRS) (Rio, Purdam, Girdwood, & Cook, 2017; Holden, o.a., 2019) . In this study this inclusion criteria was removed. Pain is individual and it is not possible to know how affected the participant is by the pain they are experiencing so even if the participant rates the pain as a low number this could be bothering and affecting quality of life (Butler & Moseley, 2010).

The Spanish squat was used as the intervention because it is a simplistic exercise that is not dependent on any technical skills and is easy to learn. It has also been used in an earlier study by Rio et al. (2017). The SLDS that is as a provocative test is used in several studies researching isometric exercise and pain (Rio, o.a., 2015; van Ark, o.a., 2016; Rio, Purdam, Girdwood, & Cook, 2017; Holden, o.a., 2019). By using these established exercises a higher reliability could be obtained.

It would have been of interest to have a control group that executed an isotonic intervention protocol. Then it would be possible to compare the isometric exercise to isotonic exercise and the RPE for both isometric and isotonic exercise to evaluate any differences or the possibility to use RPE for autoregulation of load during isotonic intervention.

Result discussion

The aim with this pilot study was to investigate if the subjective experience of exertion (RPE) of an isometric load can be used to guide how rehabilitation should be individually loaded for the patient with patellar tendinopathy to gain the best effect of the treatment. The research question was asked as follow ”Can subjective estimation of the load in an isometric intervention be a guide to optimize immediate pain reduction in people with patellar tendinopathy?” . The predefined hypothesis that participants that experienced a higher RPE would experience no decrease or increase in pain immediately after isometric intervention could not be rejected or approved due to the small sample size in this study.
However a trend could be seen when the correlation coefficient was calculated r_s(n=5; r=0,563; p=0,362) that a higher RPE gave increased pain in people with PT.

There are difficulties for the participants to estimate the RPE and pain and this is a source of error. Some of the participants report a very low pain initially (0,5-1) and a minimal change in pain after the intervention (0,5). Earlier studies have used minimally two out of ten as inclusion criteria (Rio, Purdam, Girdwood, & Cook, 2017; Holden, o.a., 2019). Pain is a subjective experience and in this study no qualitative examination was done to evaluate how the pain affected the daily life of the participants (Butler & Moseley, 2010). This makes the inclusion of all pain levels relevant because even a slight increase or decrease in pain could have massive changes for the participant quality of life.

The change in pain the participants experiences after the intervention is not as remarkable as in the study by Rio et al. (2015) but there are difference in the intervention. Rio et al. (2015) uses longer duration (5*45 seconds) isometric contraction in the leg extension machine @70% of maximal voluntary isometric contraction (MVIC) which is another load then the Spanish squat.
Pearson et al.(2018) used two groups with different duration of each set (24*10 seconds vs. 6*40 seconds) with equal time under tension. In this study there was no significant different between groups but a significant difference in pain before and after intervention (Pearson, o.a., 2018). These studies have longer time under tension in total and that is recommended to elucidate higher EIH as reported in a recent review (Naugle, Fillingim, & Riley III, 2012). The total time under tension is lower in the present study and the outcome might be more beneficial with longer duration.

The participants in this study differ from earlier studies with higher age, lower physical activity and higher BMI, all risk factors for tendinopathy (Kozlovskaia, Vlahovich, Ashton, & Hughes, 2017). This could affect the outcome and would be of interest to examine more. Within the study there is a large difference in duration of symptoms between participants. Two participants have been having pain in or not more than three months and the other participants for more than three months (36-240 months). If the continuum model of tendinopathy is applied the participants with pain less than three months might be categorized as having a reactive tendinopathy (Cook & Purdam, 2009). Cook and Purdam (2009) suggest that a reactive tendinopathy might have an increased cell activity in response to load.
The pain in tendinopathy might be driven by this increased cell activity and for this category of participants the intervention increases their pain (Rio, o.a., 2014). The duration of symptoms might be an important factor when considering amount of load.

No study has been using RPE as a guide to autoregulate loading in people with PT before. In a study on healthy, pain free, strength training people the RPE and pain seemed to correlate. Higher RPE gave higher experience of pain (Hollander, o.a., 2003). The pain that they experienced within this study might not evoke beliefs and fear of damage and might be experienced in another way than in people with PT. Pain is individual and context dependent so the result of this study should not be used when interpret the present study.
The trend in the present study is that the intervention has an immediate pain decreasing effect when RPE four or five is perceived, higher RPE increases the pain. This data can be used to guide future research questions.
Vaegter et al.(2020) found in their study a association that higher RPE gave higher EIH in a non contracting, non dominant muscle. This was done in healthy individuals. Holden et al. (2019) found that EIH local to the patellar tendon was decreased in people with PT and increased distally at the tibialis anterior muscle. This would suggest that the EIH response is changed in people with PT and the outcome in this study would indicate this as well. The participants that experience a higher exertion are also reporting more pain after at the SLDS test.

Conclusion and implications

In the light of the limitations of the study no clear conclusions can be drawn regarding the hypothesis. A trend can be discerned that higher RPE provokes the tendon and increasing the pain felt during the post intervention SLDS and that for the participants in this study RPE four to five seems to render a positive outcome. The sample size is small and no generalization can be made.
The result is interesting and could be used to guide future research. No studies have previously investigated if autoregulation with RPE could be used in people with PT to optimize outcome of an isometric intervention. Future studies are needed.

PT is a clinical diagnosis and patients seek help when they feel pain. Tendinopahy is common in elite athletes as well as recreational athletes and the pain that they feel could have large effects on their life. Earlier research indicates that people with tendinopathy decreases physical activity, work capacity and quality of life, all factors that are important for health ((YFA), 2016; World Health Organization, 2020). PT could be the reason elite athletes stop their career. This study intervention could be seen as an easy and affordable tool to rapidly manage and modulate the pain thru individualizing the load rather than handing out a set protocol. By early pain decrease the patient might be confident in returning or not ceasing physical activity or other meaningful activities. This potentially increase the health experienced by the patient in a longer perspective.

References

(YFA), Y. f. (2016). *Fysisk Aktivitet i Sjukdomsprevention och Sjukdomsbehandling.*

Abat, F., Alfredsson, H., Cucchiarini, M., Madry, H., Marmotti, A., Mouton, C., . . . de Girolamo, L. (2017). Current trends in tendinopathy: consensus of the ESKA basic science comittee. Part I: biology, biomechanics, anatomy and an exercise-based approach. *Journal of Experimental Orthopaedics, 4*(18).

Albers, I. S., Zwerver, J., Diercks, R. L., Dekker, J. H., & Van den Akker-Scheek, I. (2016). Incidence and Prevalence of lower extremity tendiniopahy in a Dutch general practice population: a cross sectional study. *BMC Musculoskeletel Disorders*.

Bohm, S., Mersmann, F., & Arampatzis, A. (2015). Human tendon adaption in response to mechanical loading: a systematic review and mela-analysis of exercise intervention studies on healthy adults. *Sports Medicine, 1*(7).

Borg, G. (1998). *Borg´s perceived exertion and pain scales.* Champaign, IL: Human Kinetics.

Brukner, P., Clarsen, B., Cook, J., Cools, A., Crossley, K., Hutchinson, M., . . . Khan, K. (2017). *Brukner & Khan´s Clinical Sports Medicine: Volume 1 Injuries* (5th edition uppl.). North Ryde: McGraw-Hill Education.

Butler, D. S., & Moseley, G. L. (2010). *Explain Pain.* Adeleide, Australia: Noi group Publications.

Cardoso, T. B., Pizzari, T., Kinsella, R., Hope, D., & Cook, J. L. (2019). Current trends in tendinopathy management. *Best Practice & Research Clinical Rheumatology*, 122-140.

Cook, J. L., & Purdam, C. R. (2009). Is tendon pathology a continuum? A pathology model to explain the clinical presentation of load-induced. *British Journal of Sports Medicine, 43*, 409-416.

Cook, J., Khan, K., Kiss, Z., Purdam, C., & Griffiths, L. (2001). Reproducibility and clinical utility of tendon palpation to detect patellar tendinopathy in young basketball players. *British journal of sports medicine*, 65-69.

Docking, S. I., & Cook, J. (2019). How do tendons adapt? Going beyonnd tissue responses to understand positive adaption and pathology development: A narrative review. *Jpurnal of Musculoskeletal and Neuronal Interaction*, 300-310.

Docking, S. I., Ooi, C. C., & Connell, D. (2015). Tendinopathy: Is imaging telling us the entire story. *Journal of orthopeadic & Sports physical therapy*, 842-852.

Ejlertsson, G. (2019). *Statistik för hälsovetenskaperna, tredje upplagan.* Lund: Studentlitteratur AB.

Everhart, J. S., Cole, D., Sojka, J. H., Higgins, J. D., Magnussen, R. A., Schmitt, L. C., & Flanigan, D. C. (2017). Treatment options for Patellar tendinopathy: A systematic review. *Arthroscopy: the journal of arthroscopic and related surgery*, 861-872.

Fearon, A. M., Cook, J. L., M, S. J., Neeman, T., Cormick, W., & Smith, P. N. (2014). Greater Trochanteric Pain Syndrome Negatively Affects Work, Physical Activity and Quality of Life: A Case Control Study. *The Journal of Arthroplasty*, 383-386.

Florit, D., Pedret, C., Casals, M., Malliaras, P., & Sugimoto, D. R. (2019). Incidence of Tendinopathy in Team Sports in a Multidisciplinary Sports Club Over 8 seasons. *Jpurnal of Sports Science and Medicine*, 780-788.

Gravare Silbernagel, K., Vincenzion, B. T., Skovdal Rathleff, M., & Thorborg, K. (2019). Isometric exercise for acute pain relief: is it relevant in tendinopathy management? *British journal of sports medicine*, 1330-1331.

Greig, L., Stephens Hemingway, B. H., Aspe, R. R., Cooper, K., Comfort, P., & winton, P. A. (2020). Autoregulation in Resistance Training: Addressing the Inconsistencies. *Sports Medicine*.

Grävare Silbernagel, K., & Crossley, K. M. (November 2015). A Proposed Return-to-Sport Program for Patients With Midportion Achilles Tendinopathy: Rationale and Implementation. *journal of orthopaedic & sports physical therapy, 45*(11).

Holden, S., Lyng, K., Graven-Nielsen, T., Riel, H., Lykkegaard Olesen, J., Larsen, L. H., & Skovdal Rathleff, M. (2019). Isomtric exercise and pain in patellar tendinopathy: A randomized crossover trial. *Journal of science and medicine in sport*.

Hollander, D., Durand, R., Trynivki, J., Larock, D., Castracane, D., Hebert, E., & Kramer, R. (2003). RPE, pain, physiological adjustment to concentric and eccentric contractions. *Medicine & Science in Sports and Exercise*.

Hollander, D., Kilpatrick, M., Ramadan, Z., Reeves, G., Francois, M., Blakeney, A., . . . Kraemer, R. (2008). Load rather then contraction type influences rate of perceived exertion and pain. *Journal of strength adn conditioning research*, 1184-1193.

Kilpatrick, M., Newsome, A., Foster, C., Robertson, R., & Green, M. (July/august 2020). Scientific rationale for RPE use in fitness assessment and exercise participation. *ACSM´s Health and fitness journal*, ss. 24-30.

Kozlovskaia, M., Vlahovich, N., Ashton, K. J., & Hughes, D. (2017). Biomedical risk factors of achilles tendinopathy in physically active peolpe: a systematic review. *Sports Medicine*. doi:10.1186/s40798-017-0087-y

Lim, H. Y., & Wong, S. H. (2018). Effects of isometric, eccentric, or Heavy slow resistance ecercises on pain and function in individuals with patellar tendiniopathy: A systematic review. *Physiotherapy Research International*.

Magnusson, S. P., & Kjaer, M. (2019). The impact of loading, unloading, ageing and injury on the human tendon. *The Journal of Physiology*, 1283-1298.

Malliaras, P., & O´Neill, S. (2017). Potential risk factors leading to tendinopathy. *apunts medicina de l´esport*, 71-77.

Malliaras, P., Barton, C. J., Reeves, N. D., & Langberg, H. (2013). Achilles and Patellar Tendinopathy Loading Programmes: A Systematic Review Comparing Clinical Outcomes and Identifying PotentialMechanisms for Effectiveness. *Sports Medicine*.

Malliaras, P., Cook, J., Purdam, C., & Rio, E. (2015). Patellar tendinopathy: Clinical diagnosis, load management, and advice for challenging case presentations. *Journal of orthopaedic & sports physical therapy*.

Naugle, K. M., Fillingim, R. B., & Riley III, J. L. (2012). A meta-analytic review of the hypoalgesic effects of exercise. *Journal of Pain, 13*(12), 1139-1150.

Naugle, K. M., Fillingim, R. B., & Riley, J. L. (2012). A Meta-Analytic Review of the Hypoalgesic Effects of Exercise. *The Jurnal of Pain*, 1139-1150.

Noakes, T. D., St Clair Gibson, A., & Lambert, E. V. (2005). From catastrophe to complexity: a novel model of integrative central neural regulation of effort and fatigue during exercise in humans: summary and conclusions. *Bristish journal of sports medicine*, 120-124.

Nuhmani, S., & Muaidi, Q. (2018). Patellar Tendinopathy: A Review of Literature. *Journal of Clinical and Diagnostic Research*, YE01-YE06.

O´Sullivan, K., O´Sullivan, P., Gabbet, & Tim. (2018). Pain and fatigue in sport: are they so different? *British Journal of Sports Medicine*.

Pearson, S., Stadler, S., Menz, H., Morrissey, D., Scott, D., Munteanu, I., & Malliaras, P. (2018). Immediate and short-term effects of short- and long-duration isometric contractions in patellar tendinopathy. *Clinical journal of sports medicine*.

Purdam, C. R., Cook, J. L., Hopper, D. M., Khan, K. M., & group, V. t. (2003). Discriminative ability of functional loading tests for adolescent jumper’s knee. *Physical Therapy In Sports*, 3-9.

Rio, E., Kidgell, D., Purdam, C., Gaida, J., Moseley, G. L., Pearce, A. J., & Cook, J. (2015). Isometric exercise induces analgesia and reduces inhibition in patellar tendinopathy. *British Journal of Sports Medicine*, *49*, 1277-1283.

Rio, E., Moseley, L., Purdam, C., Samiric, T., Kidgell, D., Pearce, A. J., . . . Cook, J. (2014). The Pain of Tendinopathy: Physiological or Pathophysiological? *Sports Medicine*(44), 9-23.

Rio, E., Purdam, C., Girdwood, M., & Cook, J. (2017). Isometric exercise to reduce pain in patellar tendinopathy in-season; is it effective "on the road?". *Clinical Journal of Sports Medicine, 0*(0), 1-5.

Rio, E., Purdam, C., Girdwoog, M., & Cook, J. (2019). Isometric Exercise to Reduce Pain in Patellar Tendinopathy In-Season:; Is it effective "on the road". *Clinical journal of sports medicine*, 188-192.

Scott, A., Docking, S. V., Alfredson, H., Zwerver, J., Lundgreen, K., Finlay, O., . . . Danielson, P. (2013). Sports and exercise-related tendinopathies: a review of selected topical issues by participants of the secondinternational scientific tendinopathy symposium (ISTS) Vancouver 2012. *British Jpurnal of Sports Medicine, 47*, 536-544.

Sharma, P., & Maffulli, N. (2006). Biology of tendon injury: healing, modeling and remodeling. *Journal of Musculoskeletal Neuronal Interaction, 6*(2), 181-190.

Vaegter, H. B., Damgaard Lygn, K., Wannebo Yttereng, F., Holst Christensen, M., Brandhoj Sorensen, M., & Graven-Nielsen, T. (2019). Exercise-Induced Hypoalgesia After Isometric Wall Squat Exercise: A Test-Retest Reliabilty Study. *Pain Medicine*, 129-137.

Vaegter, H. B., Thingsgaard, P., Höj Madsen, C., Hasenbring, M., & Bloch Thorlund, J. (April 2020). Power of word: Influence of Preexercise Information on Hypoalgesia after exercise - Randomized controled trial. *Medicine and Science in sports and exercise*.

van Ark, M., Cook, J. L., Docking, S. I., Zwerver, J. G., van den Akker-Scheek, I., & Rio, E. (2016). Do isometric and isotonic exercise programs reduce pain in athletes with patellar tendinopathy in season? A randomised clinical trial. *Journal of Science and Medicine in Sport, 19*, 702-706.

Vander Doelen, T., & Jelley, W. (2020). Non-surgical treatment of patellar tendinopathy: A systematic review of randomized controlled trials. *Journal of science and medicine in sports*, 118-124.

Wang, J. H.-C. (2006). Mechanobiology of tendon. *Journal of Biomechanics*, 1563-1582.

Weston, M., Siegler, J., Bahnert, A., McBrien, J., & Lovell, R. (2015). The application of differential ratings of perceived exertion to Australian football leuge matches. *Journal of Science and Medicine in Sports*, 704-708.

World Health Organization. (2020). Hämtat från Basic Documents - 49th edition: https://apps.who.int/gb/bd/pdf_files/BD_49th-en.pdf#page=7

World Medical Association. (den 9th July 2018). Hämtat från https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/

Appendix

Appendix 1 – Information

PATIENTINFORMATION ANGÅENDE STUDIE SAMT SAMTYCKE

Isometrisk kontraktion vid patellar tendinopati
Kan upplevd ansträngning användas som guide för optimal minskning av smärtan vid en isometrisk kontraktion?

Bakgrund

Tendinopati, smärta och nedsatt funktion i senan, är ett vanligt besvär som drabbar såväl fysiskt aktiva, som de som inte har en lika fysiskt aktiv vardag. Hopparknä (patellar tendinopati) är vanligt inom aktiviteter som innefattar mycket hopp, riktningsförändringar och andra rörelser med explosiva inslag. Numera är konservativ behandling, i form av träning, första valet vid behandling. Isometrisk kontraktion har visat sig att ha omedelbar smärtreducerande effekt, men även denna intervention är svår att belasta optimalt. Målet med studien är att undersöka om en subjektiv skattning av hur ansträngande den isometriska belastningen är, kan användas som guide för interventionens belastning för att optimera den omedelbara smärtreduktionen.

Tillfrågande om deltagande
Vi tillfrågar nu dig som har patellar tendinopati (hopparknä) att delta i denna pilotstudie. Syftet med studien är att undersöka om det finns någon korrelation mellan hur ansträngande en isometrisk belastning är och stor den omedelbara smärtreduceringen efter interventionen är.

Studiens genomförande

Ett par dagar efter att du fått informationsbrevet och samtyckesdokumentet kommer studieansvarig Andreas Härdner Lennartsson ringa upp dig och tillfråga dig om du önskar delta. Om du då väljer att delta kommer du att bokas in för undersökning samt intervention. Denna studie innebär ett tillfälle där undersökning och intervention genomförs. Som en del av interventionen kommer du att få genomföra ett provokativt test för att sedan skatta hur smärtsamt detta var innan interventionen. Efter interventionen kommer samma test genomföras och en skattning av hur smärtsamt testet efter interventionen är och skatta hur ansträngande interventionen upplevdes för dig.

Tidsåtgång

Undersökning och interventionstillfället är 45 minuter och du kommer inom studien vara på plats vid enbart ett tillfälle.

Risker

De kända riskerna är möjlig provokation av smärtan dagen/arna efter interventionen. Träningsvärk kan upplevas 24-48h efter interventionen. Isometrisk kontraktion är sällan förknippat med allvarligare muskelskador, t.ex. ruptur/bristning.

Fördelar
Fördelar associerade med interventionen är omedelbar reducering av upplevd smärta från senan. Det råder för närvarande ingen klarhet kring hur interventionen skall belastas för största effekt. Ett deltagande innebär att du bidrar till ökad kunskap i hur denna belastning kan justeras.

Vad händer om jag inte vill vara med

Deltagandet är frivilligt och du har full rätt att när som helst avbryta.

Hantering av data och sekretess

Dina personuppgifter och all information som samlas in under studien kommer att behandlas konfidentiellt och allt material avkodas. Dina svar och dina resultat kommer att behandlas och förvaras på ett sådant sätt så att obehöriga inte kan ta del av dem. Vid eventuell presentation av studien kommer inte några namn att förekomma, deltagarna kommer inte kunna identifieras.

All hantering av insamlad data görs av studieansvarig Andreas Härdner Lennartsson.

Försäkring

Alla studiedeltagare omfattas vid behandlingstillfällena av de behandlande terapeuternas ansvarsförsäkring.

Frivillighet
Deltagandet är frivilligt och kan när som helst avbrytas utan förklaring och utan att det påverkar omhändertagandet. Vid frågor kontakta studieansvarig.

Ansvarig för studien, ytterligare information:
Andreas Härdner Lennartsson

Institutionen för kost- och Idrottsvetenskap, Göteborgs Universitet
Mail: andreas@kba.se
Telefon 0735-008029

Smärta – Borg CR10 skala

0	Inget alls	Nothing at all
0,5	Mycket, mycket svag	Extremely weak
1	Mycket svag	Very weak
2	Svag	Weak
3	Måttlig	Moderate
4		
5	Kraftig	Strong
6		
7	Mycket kraftig	Very strong
8		
9		
10	Mycket, mycket kraftig	Extremely strong
•	Maximal	

Rate of perceived exertion (RPE) – Borg CR10 skala

0	Inget alls	Nothing at all
0,5	Mycket, mycket lätt	Extremely easy
1	Mycket lätt	Very easy
2	Lätt	Easy
3	Något ansträngande	Moderate
4		
5	Ansträngande	Strenous
6		
7	Mycket ansträngande	Very strenous
8		
9		
10	Mycket, mycket ansträngande	Extremely stenous
•	Maximal	