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DANSK **SPORTSMEDICIN**

FORSKNING VED INSTITUT FOR IDRÆT OG BIOMEKANIK
SYDDANSK UNIVERSITET





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Et nyt frisk Dansk Sportsmedicin til lige at toppe en forhåbentlig god sommer op for dig.

Denne udgave er gæsteredigeret af forskere ved Institut for Idræt og Biomekanik (IOB), Syddansk Universitet. Ewa Roos har samlet trådene og resultatet viser, at hun omgives af en flok dygtige og meget engagerede forskere på en meget energisk arbejdsplads. De har leveret i alt 11 artikler:

Fire flotte resuméer af nye PhD-afhandlinger om knæets biomekanik, artrose, træning, betydningen af træningskonteksten og patientrapportet outcome-mål efter knæoperation.

Jonas Thorlund og Kenneth Pihl diskuterer sammenhængen mellem meniskskader og mekaniske symp-

tomer på baggrund af data fra Knee Arthroscopy Cohort Southern Denmark (KACS).

Gæsteforsker Stephanie Filbay fra UK har undersøgt, hvad der prædikerer forringet 5 års outcome efter akut ACL ruptur og peger på, at vi på baggrund af patientkarakteristika måske kan blive bedre til at anbefale den rigtige behandling.

Godt Liv med Artrose i Danmark (GLA:D®) er en evidensbaseret behandlingsindsats, som de seneste 5 år er blevet en fast del af behandlingstilbuddet til borgere med knæ- eller hofte artrose. Dorte Grønnes artikel gør status over disse fem år og Alice Kongsted skriver om uddannelse og træning som behandling for rygsmerter - foreløbige erfaringer med GLA:D® Ryg.

Forskningsenheden Exercise Epidemiology, IOB, har de seneste 3-4 år gennemført en række studier, der undersøger betydningen af cykling til arbejde og i fritiden i forhold til udvikling af de to store folkesygdomme: type 2-diabetes og hjertesygdom. Forskningsleder Anders Grøntved og kolleger har samlet denne viden til Dansk Sportsmedicins læsere og viser,

at cykling blot en time eller to om ugen reducerer risikoen for at udvikle sygdommene betydeligt. Resultaterne har vakt stor international opmærksomhed, og amerikanske forskere henviser til Danmark som inspiration, som et godt cykelland (kultur og infrastruktur) hvor mange cykler, men hvor der også er plads til forbedringer der vil kunne gavne folkesundheden - fx er der stadig 40% af dem, som har under 10 km til arbejde, der tager bilen!

Center for Muscle and Joint Health, IOB, har fornyligt fået tilknyttet professor Bart Koes fra Rotterdam Han har gennemgået litteratur der viser, at brugen af NSAID blandt atleter er alt for høj (mellem 50-100% de seneste 3-12 måneder!) og effekten minimal. Merete Møller lægger meget forfriskende op til en debat om, hvorfor så mange unge atleter stadig bliver skadet, når de dyrker deres sport! Vi ved bedre! Hvorfor er det så svært at handle der-efter?

Kære læsere, god fornøjelse med læsningen – og giv endelig dit besyv med i debatten om forebyggelse af idrætsskader hos vores udøvere.

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Nummer	Artikelstof	Annoncer	Udkommer
4/2018	15. oktober	1. november	i november
1/2019	1. december 2018	15. december 2018	i januar 2019
2/2019	15. april	1. maj	i maj
3/2019	1. juli	15. juli	i august

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TILGANG

Tidsskriftet udkommer online 4 gange årligt i månederne januar, maj, august og november. Målgruppen er medlemmer af Dansk Idrætsmedicinsk Selskab og Dansk Selskab for Sportsfysioterapi samt andre idrætsmedicinsk interesserede. Tilgangen er åben for alle.

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Dansk
Idrætsmedicinsk
Selskab

v/ Kristoffer W. Barfod,
formand



Lægerne er nøglen til den rene sport

Sommeren 2018 udmærker sig ikke alene ved at være den varmeste og tørreste i 100 år. Sommeren udmærker sig også ved at have været ren, ren for doping. Jeg husker dårligt hvornår der sidst har været et Tour de France uden beskæmmende dopinghistorier, og så alligevel ikke helt, for i år var der jo Chris Froomes Salbutamol-sag op til Touren, hvor han måtte leve i uvished om sin ret til deltagelse helt indtil ugen, hvor touren begyndte. En sag der ikke kan have undgået at influere på hans forberedelse til Touren og måske var indirekte årsag til at Froome 'tabte sejren'.

Er det fair? Spørger professor i etik Thomas Søbirk Petersen i sin nye bog 'Fri Doping – Et forsvar for en ny doping politik'. Gennem en logisk etisk argumentation fremfører han tre hovedargumenter for at legalisere doping: 1) "Doping kan være sundt, hvis det bliver givet i små mængder, i korte perioder og under lægelig rådgivning". 2) En legalisering vil medføre at "atleter, der anvender legal doping vil være i løbende kontakt med læger, som kan informere om bivirkninger og hjælpe med den rette dosis og kvalitet, så helbredet ikke lider skade." og 3) At det er dobbelt moralsk at forbyde doping pga. den sundhedsskadende virkning at da man har valgt ikke at forbyde alkohol og rygning, eller for den sags skyld motorsport, amerikansk fodbold, ridning, cykling og bjergbestigning, der alle er sportsgrene der kan have fatal udgang.

Dette er en åbenlyst kontroversiel udmelding. DIMS hilser en diskussion af dopingreglerne, samt måden de håndhæves på, velkommen, da

der unægtelig er sager hvor atleterne kommer i klemme i det meget rigide system.

Men der må ikke være tvivl om at DIMS støtter en ren sport uden brug af doping.

Atleter med sygdomme der begrænser deres udfoldelse skal have den bedst mulige hjælp til at behandle patologiske reaktioner som f.eks. astma, men at tillade brug af epo og anabole stoffer i udholdenhedssport for at give atleterne bedre mulighed for at restituere er en anden sag. Det vil flytte atleternes grundniveau og give dem mulighed for at yde mere, med deraf følgende øgede krav for restitution. Det vil ikke forhindre atleterne i at bryde grænseværdierne og presse kroppens fysiologiske grænse yderligere, med kendte og ukendte risici for helbredet til følge.

Man kan let forestille sig en situation, hvor deltagelse i elitesport forudsætter et tæt samarbejde med en idrætslæge der er ansvarlig for optimering af atletens fysiologiske formåen. Lægen og atleten vil blive et team hvor konstant titrering af anabole stoffer, epo, astma medicin mv. bliver lige så afgørende som atletens træningsmængde og talent. Der vil kommet et yderligere spring imellem den brede idræt, hvor lægelig ekspertise ikke kan være til stede, og de professionelle atleter, som vil være tvunget til at tage doping for at være med.

DIMS arbejder for at skabe de bedste, stærkeste og sundeste atleter. Vi ønsker at bidrage med viden om forebyggelse og behandling af skader samt rådgivning om bl.a. træning og restitution. Vi ser på ingen måde

behandling med epo og anabole stoffer som acceptabelt. Det er præstationsfremmende stoffer, der udover at eliminere fairness i sporten medfører risiko for atleternes sundhed. Det er i direkte modstrid med lægeløftet at give sådan behandling.

**DIMS holdning er klar:
Idrætslægerne siger nej til doping!**



Dansk Selskab
for
Sportsfysioterapi

v/ Karen Kotila,
formand



Fysisk inaktive borgere

De fleste fysioterapeuter kender det: sammen med patienten/borgeren udarbejdes en genoptræningsplan, eller en rapport med anbefalinger for patientens træning efter endt genoptræning. Patienten/borgeren er meget positiv, energisk og villig til at fortsætte den gode træning - men på ens skulder sidder den lille djævel som hvisker "han får det jo ikke gjort" eller "hun falder jo fra". Og statistisk set ja - så falder mange fra, trods de gode intentioner. Den nationale sundhedsprofil 2017 indeholder en undersøgelse af, hvor fysisk aktive danskerne er. Undersøgelsen viser blandt andet, at 28,8 % af den voksne befolkning (16 år og derover) er fysisk inaktive. Undersøgelsen viser også, at der er stor social ulighed i andelen af fysiske inaktive danskere. Blandt personer med en grundskole som højest gennemførte uddannelse er 42 % fysisk inaktive, mens det for personer med lang videregående uddannelse er 24 %.

Undersøgelsen understøtter ovenstående scenarie om en patient/borger med de gode intentioner om at fortsætte træningen: 71 % af inaktive borgerne ønsker at være mere fysisk aktive. Alligevel sidder den lille djævel på skulderen og får os til at tvivle på, om borgeren vi slipper i vores genoptræningsforløb nu også får efterlevet de gode intentioner. Ville det ikke være rart, om der var en måde at følge borgeren godt på vej ud i foreningslivet.

I foråret 2018 blev DSSF kontakttet af DSF for at deltage med et udvalgsmedlem i en arbejdsgruppe nedsat i regi af Sundheds- og Ældreministeriet. Opgaven var at identificere og beskrive mulige initiativer, der kan bidrage til at styrke samarbejdet om

fysisk aktivitet mellem sundhedsvæsenet og civilsamfundet. Sportsfysioterapeut Anja Dürr, som til dagligt arbejder på et genoptræningscenter i Odense kommune, har tidligere arbejdet med motion på recept og er aktiv i DGI regi, blev peget på til at være DSF og DSSFs repræsentant i arbejdsgruppen. Anja har bidraget med viden og erfaring fra "det virkelige liv" og har med sin faglige og arbejdsmæssige baggrund stor indsigt i de problemstillinger der skulle adresseres i gruppen.

I kommissoriet fremgår det at følgende problemstillinger skulle adresseres:

- Hvordan udnytter vi de muligheder, som foreninger kan rumme for sundhedsindsatser, herunder forebyggelse af sygdom og understøttelse af gode forløb gennem fysisk aktivitet?
- Hvordan skabes der bedre muligheder for samarbejde mellem kommuner og foreninger?
- Hvordan sikrer vi, at sundhedsvæsenet bedst muligt kan samarbejde med civilsamfundet om sundhedsindsatser, herunder formidle deltagelse i relevante tilbud?

Arbejdsgruppen har i deres arbejde identificeret særlige målgrupper i den danske befolkning som er fysisk inaktive og er underrepræsenteret i idræts- og foreningslivet. Arbejdsgruppen har yderligere peget på, hvilke udfordringer der er for disse grupper at blive tilknyttet idræts- og foreningslivet, herunder at "den enkelte borger ikke oplever mulighed for at deltage i aktiviteterne, at der ikke er tilbud og aktiviteter, der kan rumme den enkelte borgers behov og at borgere ikke i tilstrækkelighed

grad guides til at blive fysisk aktive, når borgere er i kontakt med sundhedsvæsenet".

Der findes gode idrætstilbud - og hver kommune og hver organisation har hver deres platform og måde at formidle og henvise borgere til aktiviteter. Arbejdsgruppen har derfor peget på mulige indsatser, kommet med en række gode cases fra forskellige eksisterende tiltag og har også bidraget med anbefalinger til mulige fremtidige tiltag. Som eksempel skal her fremhæves arbejdsgruppens anbefaling om, at kommuner og regioner i samarbejde med foreninger afprøver konceptet "Motion og Fællesskab på recept". Altså, at borgeren kan guides til en idrætsaktivitet, evt. i foreningsregi, som en del af et forebyggende tilbud eller behandlingstilbud. Dette koncept vil kræve fagligt kompetente sundhedspersonaler i tæt samarbejde med foreninger, og vil også kræve at foreninger har den nødvendige ekspertise og viden til at modtage borgere, som eksempelvis har afsluttet et genoptræningsforløb og nu ønsker at fortsætte sine gode intentioner om at være fysisk aktiv. Der er ofte et stykke vej fra borgeren bliver sluppet som patient i et genoptræningsforløb til at denne kan træde ind på et motionsfodboldhold, og det er i denne overgang, at vi skal være opmærksomme på ikke at "tabe borgeren på gulvet". Det er også i denne overgang, at sportsfysioterapeuter har særlige faglige forudsætninger for at guide borgeren sikkert på vej ud i idrættens verden. Det er et spændende tiltag og vi håber, Danske Fysioterapeuter og Dansk Selskab for Fysioterapi griber bolden og dribler videre med arbejdsgruppens anbefalinger i samarbejde med DGI og DIF.

Guest editorial

Ewa M. Roos

The research environment at University of Southern Denmark is expanding; three of the research units in Odense have formed Center for Muscle and Joint Health. We are over 50 active researchers in the Center, including approximately 25 PhD students. We have diverse backgrounds including physiotherapy, chiropractic, medicine, psychology, exercise physiology and biology, and have the capacity to engage with key research questions from a broad bio-psycho-social perspective. You can learn more about the Center in a minute and a half by watching this video: <https://m.youtube.com/watch?v=qwOogwMrvKA>.

In this issue of *Dansk Sportsmedicin*, you will first get a glimpse of how important biomechanical risk factors are in knee osteoarthritis, the impact of exercise on knee joint cartilage, placebo or context effects from exercise in people with knee or hip pain, and in-depth analyses of the concepts minimal important change and patient acceptable symptom state. All these articles are summaries of PhD-theses recently and successfully defended by Joyce van Tuijn, Alessio Bricca, Louise Sandal and Lina Ingelsrud.

Second, Professor Bart Koes, from Rotterdam and since 2018 affiliated with Center for Muscle and Joint Health, presents himself with an article about NSAIDs use among athletes. While I am sure the frequent NSAID use is no surprise to those of you working "back stage" the intake is scary and calls for action to increase awareness of side effects, in both professional and recreational athletes. In January 2018 we were lucky enough to welcome Assistant Professor Merete Møller back home to Denmark after working with injury

prevention in Norway. Merete will focus on implementing injury prevention programs, and contributes with a "Call for Action". Send her an email if you would like to join her on her quest to let young athletes enjoy sports and be able to have a long physically active life, free from injuries and pain.

Third, you will be updated on the latest findings from a large Danish cohort having had knee arthroscopy. The findings are challenging the current clinical guidelines on meniscus pathology, and will for sure spark a good discussion among those treating middle-aged people with knee problems.

Finally, you find a section of three articles on implementation of research

into the real world. Anders Grøntved and team shares with you the benefits from cycling on heart disease and diabetes, the GLA:D team shares the newest results from the more than 30.000 patients who have participated in GLA:D because of their knee or hip problems, and finally the new kind on the block, GLA:D Back, presents itself.

I hope you will enjoy the read!



Ewa Roos, Guest editor
Professor and Research Leader, Institute for Sports and Clinical Biomechanics, University of Southern Denmark



If you were in the area of Christiansborg and Slotsholmen in Copenhagen on Sunday July 7, you maybe saw people running around like crazy. We were 4000 master athletes, aged 35-99, participating in the Sprint final of the World Master Orienteering Championships. As you can see, it was a lot of fun! PS. Many years ago we showed that soccer players continue to play, despite pain and functional limitations. I can assure you that goes for older orienteers as well. Not sure surgeons want to know about the number of people with hip and knee replacements running down the streets of Copenhagen at their fullest speed. My mother, 86 years old, finished second, not stopped by her bone-on-bone knee osteoarthritis, managed with exercise and a single NSAID 2 hours prior to competing.

The role of biomechanics in knee osteoarthritis

– a biomechanical profile and its importance for risk and treatment

Joyce van Tunen. MSc

On June 22nd 2018 physical therapist and human movement scientist Joyce van Tunen defended her PhD thesis "The role of biomechanics in knee osteoarthritis – A biomechanical profile and its importance for risk and treatment". This PhD project has been conducted within the FOF Research Unit at the Department of Sports Science and Clinical Biomechanics at the University of Southern Denmark. This project has been part of the KNEEMO Initial Training Network in Knee Osteoarthritis Research, and is funded through the European Commission's Framework 7 Programme.



Knee osteoarthritis (OA) is a common musculoskeletal disorder, with more than 200 million people affected worldwide. Biomechanical factors are assumed to play an important role in the pathogenesis of OA. Although it is commonly thought that those biomechanical factors are well studied in individuals with knee OA, systematic reviews of the available evidence are limited. In addition, the presence of OA risk factors in young individuals is not well studied. Treatments for knee OA often aim to modify biomechanical factors, but it is unknown how knee unloading shoes affect loading distribution in the foot. The aim of this thesis was to investigate the role of biomechanical factors at different stages over the course of knee OA.

In the first and second papers, the association of knee OA with skeletal

malalignment, muscular dysfunction, impaired proprioception, laxity and abnormal loading during gait was examined in a systematic review and meta-analysis. Analyses across 59 cross-sectional studies (5,328 patients with knee OA and 4,497 controls) showed that patients with knee OA have higher odds of having lower muscle strength, proprioception deficits, more medial varus-valgus laxity and less lateral varus-valgus laxity compared with healthy controls. Patients with medial knee OA have higher odds of having a higher knee adduction moment than healthy controls.

In the third paper, knee and/or hip pain and several known risk factors for OA were examined in a survey in a population of 2,661 29-59-year old Danes. Pain was prevalent in 27% of participants. Multiple known risk factors for

knee and hip OA, such as joint injury and higher body mass index, were found to be associated with the presence of knee/hip pain.

In the fourth paper, the effect of unloading shoes (Fig. 1) on plantar pressures (Fig. 2) was examined in 21 patients



Figure 1. Knee unloading shoes.



Figure 2. Example of plantar pressures.

with medial knee OA. Unloading shoes significantly increased lateral heel and lateral forefoot force, with concurrent decreases in the medial regions. Foot posture, foot mobility magnitude and navicular drop did not moderate the effect of footwear on outcomes.

The results of this thesis suggest that biomechanical factors play a role over the course of knee OA. At first, an overview of the literature showed that patients with knee OA are more likely to display a number of specific biomechanical characteristics. Furthermore multiple known OA risk factors, including biomechanical factors, were found to be associated with knee/hip pain in younger individuals. The presence of multiple modifiable OA risk factors in younger adults may help earlier identification of individuals at high risk of developing OA. Finally, compared to conventional shoes, unloading shoes caused an expected lateral shift in foot pressure.

Clinicians (e.g. general practitioners, physiotherapists) should be aware of the importance of (biomechanical) risk factors for OA at different stages of the disease. We have identified multiple local biomechanical characteristics that are often present in people with knee OA (second paper). Clinicians should seek to identify these possible biomechanical impairments. In this way, interventions could aim to improve these limitations, leading to improved physical function and quality of life. In addition to this, risk factors for the development of OA can already be present in individuals at a young age, especially in those with joint pain (third paper). Clinicians should be aware of this, and use this information to identify young individuals who are at a higher risk of

developing knee OA. Since individuals usually present themselves in the health care system when they experience pain, this is a timely opportunity to intervene in OA risk factors with e.g. weight management and injury prevention programs. Furthermore, clinicians should aim to select patients appropriate for knee unloading footwear. A shift in pressure might be undesirable in some patients, for example those with diabetes, a common comorbidity in patients with OA.

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Exercise does not 'wear down my joints'

— systematic reviews and meta-analyses

Alessio Bricca, PhD fellow

Research Unit for Musculoskeletal Functions and Physiotherapy, University of Southern Denmark

Brief summary

Exercise is the most effective pain relief in people with symptomatic knee osteoarthritis. Yet, many people with knee osteoarthritis still believe that exercise may 'wear down my joints' creating a barrier to exercise. To find out whether exercise is harmful or not, I performed three systematic reviews of randomized controlled trials investigating the impact of exercise on articular cartilage health assessed via imaging and molecular biomarkers in people at risk of, or with, knee osteoarthritis and in healthy animals. The results of the three systematic reviews suggest that in people at risk of, or with knee osteoarthritis, exercise is safe for articular cartilage health. Similarly, a moderate dose of exercise in healthy animals is not harmful, while a too high (e.g. dogs running a marathon every day for a year) or too low (e.g. rodents allowed only short bouts of exercise), may have a detrimental effect. Patients can be reassured that the exercise commonly prescribed to prevent or treat symptomatic knee osteoarthritis is safe for articular cartilage health.

Papers included in thesis:

I. Bricca A, Juhl CB, Grodzinsky AJ, Roos EM. Impact of daily exercise dose on knee joint cartilage - a systematic review and meta-analysis of randomized controlled trials in healthy animals. *Osteoarthritis Cartilage*. 2017 Aug;25(8):1223-1237.

II. Bricca A, Juhl CB, Steultjens M, Wirth W, Roos EM. Impact of exercise on articular cartilage in people at risk of, or with established, knee osteoarthritis: a systematic review of randomised controlled trials. *Br J Sports Med*. 2018 Jun 22.

III. Bricca A, Struglics A, Larsson S, Steultjens M, Juhl CB, Roos EM. Impact of exercise therapy on molecular biomarkers related to cartilage and inflammation in people at risk of, or with established, knee osteoarthritis: a systematic review and meta-analysis of randomized controlled trials. Submitted.

What did I investigate?

The overall aim of my PhD thesis was to compile the evidence with regard to the impact of exercise on knee joint articular cartilage health, assessed via histology in healthy animals and via imaging (MRI) and molecular biomarkers (from joint fluids and urine) in people at risk of, or with, knee osteoarthritis (OA). This aim was investigated in three different studies as shown in Figure 1.

Why did I do it?

Exercise is medicine also for knee osteoarthritis (1). Two to three times a week of supervised exercise therapy, aimed at improving aerobic capacity, quadriceps muscle strength or lower extremities performance, is considered the optimal therapeutic exercise for knee OA (2). It is clinically safe (3) and effective to reduce symptoms and improve functionality (4, 5) but its impact on articular cartilage, the hallmark of

OA, is less known. Additionally, some people with symptomatic knee osteoarthritis still believe that exercise may have detrimental effects on the knee joint creating a barrier to exercise.

Articular cartilage is the hallmark of OA and the structure studied in my PhD. It is a connective tissue that covers bone ends in the joints and provides lubrication of the meeting surfaces, allowing the transmission of loads with a low frictional coefficient (6). Articular

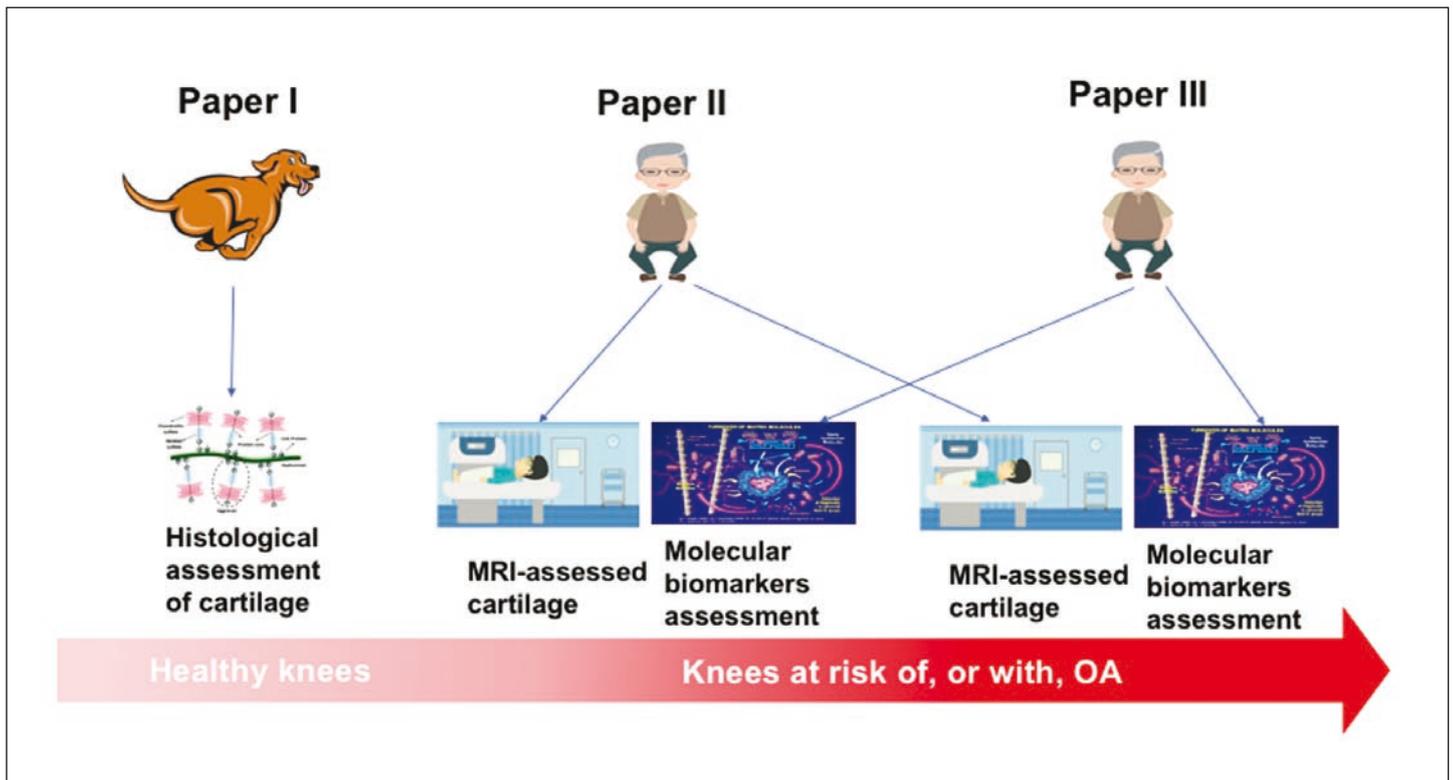


Figure 1. Thesis overview. Papers I, II and III represent the three systematic reviews conducted in this project and the OA continuum is represented by the red arrow.

cartilage is comprised of an extracellular matrix containing water, cells and molecules (7) which allow cartilage to resist a wide range of loading magnitudes (8-10). Overall, aggrecan, collagen and molecular biomarkers are responsible for maintaining cartilage integrity, function and metabolism (11) and the loss of some of these components, as occur in the OA disease, jeopardize cartilage health (12).

Mechanical loading is indispensable to preserve cartilage integrity and composition (7, 13). In fact, cartilage contains cells with mechanosensitive properties (i.e. chondrocytes), which have the ability to convert mechanical loading into cellular response similarly to other tissues such as bones, muscles and ligaments. While cyclic and dynamic loading at a moderate dose (from a combination of frequency and intensity) can be beneficial for the cartilage (14), static loads are linked to a cartilage degeneration (15). Collectively these knowledge serves as a rationale for the application of a moderate dose of exercise to promote cartilage health.

Figure 2 shows the theoretical framework by which the load gene-

rated from exercise on the knee joint is believed to promote structural and compositional cartilage changes in combination with pro-inflammatory and cell biology factors. Furthermore, due to the multifactorial nature of the OA disease, other factors may mediate the relationship between exercise and cartilage health by slowing down or accelerating the progression of the disease (Figure 2).

Methods to summarize the current evidence

Systematic reviews are cornerstone in the healthcare decision-making process (16). They consist of identifying, appraising and synthesizing all the empirical evidence that meets pre-specified eligibility criteria to answer a specific research question (17). In this project, the pre-specified eligibility criteria following the PICO framework are shown in Table 1.

Meta-analysis was performed when at least three studies investigated the same outcome in comparable populations, otherwise we summarized the effect of exercise on cartilage health narratively. This was pre-specified in

the systematic review protocols published in the Systematic Review Center for Laboratory animal Experiment (SYRCLE) database for Paper I and in the PROSPERO database for Papers II and III.

The quality of evidence was assessed using the SYRCLE risk of bias tool for animal studies (18) in Paper I, the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach assessment was used in Paper II and III. In all the studies, the quality of evidence was assessed independently by two authors from the study team and agreement reached by discussion.

Is exercise harmful for articular cartilage?

Exercise is not harmful for articular cartilage in people at risk of, or with symptomatic knee OA. Similarly, a moderate dose of exercise in healthy animals is not harmful, while a too high (e.g. dogs running a marathon every day for a year) or too low (e.g. rodents allowed only short bouts of exercise), may have a detrimental effect (Figure 3).

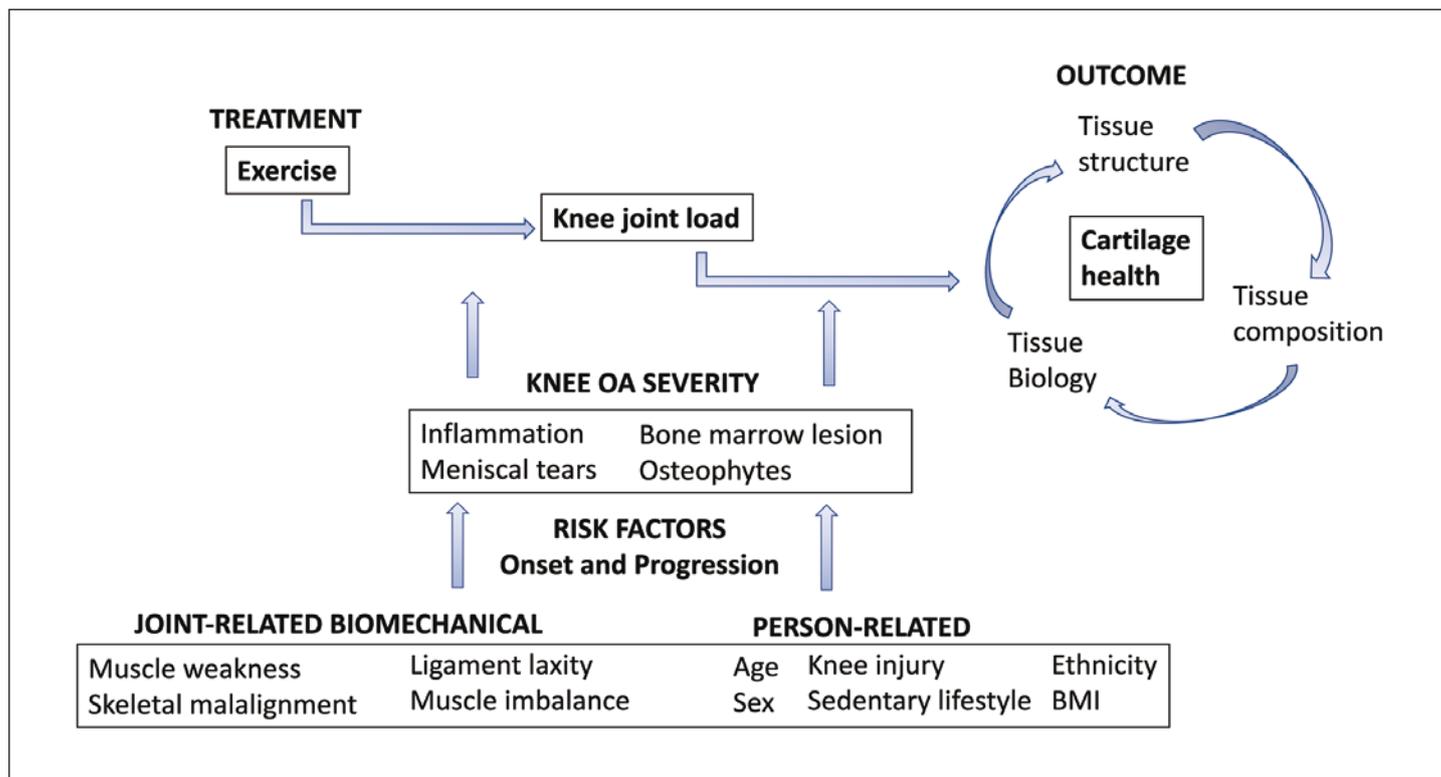


Figure 2. Theoretical framework by which exercise may lead to articular cartilage changes.

	Paper I	Paper II	Paper III
Participants	Healthy animals	Individuals at risk of, or with, OA*	
Interventions	At least one intervention group receiving any type of knee joint loading exercise intervention		
Comparisons	Non-exposed group receiving control treatment, usual care or placebo		
Outcomes	Cartilage aggrecan content, collagen content and cartilage thickness	Cartilage MRI-assessed	Molecular biomarkers assessed via blood, urine and joint fluid samples related to cartilage and inflammation
Study design	Randomized controlled trials		

Table 1. Eligibility criteria for studies included this thesis.

*As defined by the authors of the original papers, participants at risk of knee OA are those with risk factors (e.g. knee injury treated with or without surgery, or BMI ≥ 25) associated with the development or progression of the disease, while participants with OA are those with a clinical diagnosis of OA (i.e. according to the American College of Rheumatology criteria) with or without pain or radiographic signs of knee OA (Kellgren-Lawrence (KL) grade >1), in the tibiofemoral and/or patellofemoral compartments of one or both knees.

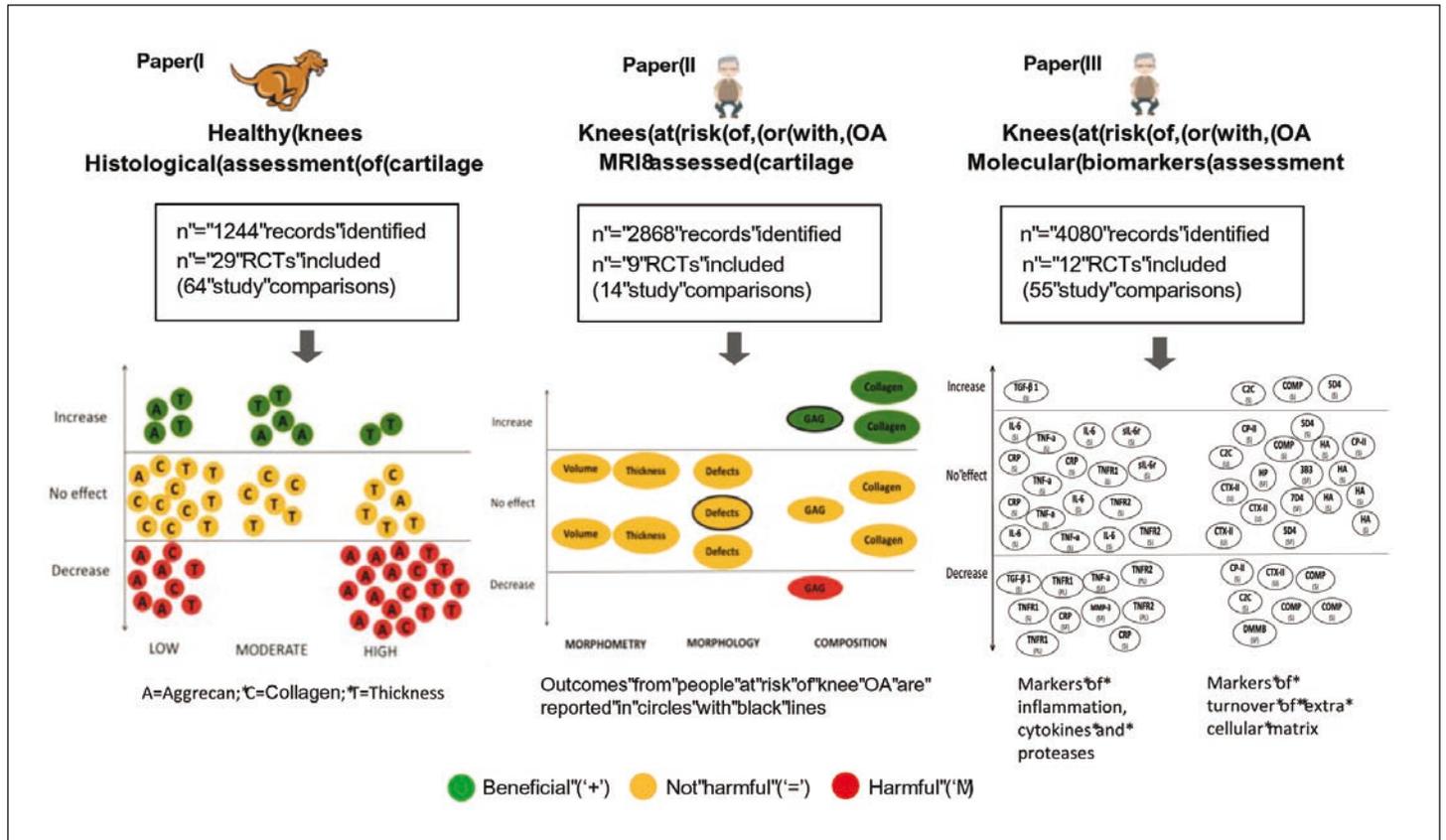


Figure 3. Schematic overview of the included studies. Flow chart of the included studies in Papers I, II and III and narrative summary of results for Paper I, II and III. Each circle represents a between-study comparison. Each study investigated at least one outcome of interest, however, some studies investigated more than one outcome.

In healthy animals (Paper I), we found 29 RCTs involving 64 study comparisons, including exercise interventions of low, moderate or high dose investigating cartilage structure (i.e. thickness) and composition (i.e. aggrecan and collagen). Overall, in the low dose exercise group, 21 out of 25 (84%) comparisons reported negative or no effect on cartilage thickness, aggrecan and collagen. In the moderate dose exercise group, all 12 comparisons reported no or positive effect. In the high dose exercise group, 25 out of 27 (93%) comparisons reported no or negative effect (19).

In people at risk of, or with, knee OA, MRI-assessed articular cartilage outcomes (Paper II) were investigated in nine RCTs, including 14 study comparisons, investigating cartilage morphometry (i.e. thickness and volume), morphology (i.e. defects) or composition (i.e. glycosaminoglycans (GAG) and collagen). Two studies included participants at increased risk of knee OA and

12 studies included participants with knee OA. In participants with increased risk of OA, one study comparison reported no effect on cartilage defects and one had positive effects on GAG. In participants with established OA, six study comparisons reported no effect on cartilage thickness, volume or defects; one reported a negative effect and one no effect on GAG; two reported a positive effect and two no effect on collagen. Overall, only one out of 14 comparisons reported a negative effect on knee joint articular cartilage assessed by MRI (20).

In people at risk of, or with, knee OA, molecular biomarkers related to systemic inflammation and to turnover of cartilage extracellular matrix (Paper II) were investigated in 12 RCTs, involving 55 comparisons. Overall, 17 out of 55 (31%) study comparisons, reported a decrease in cartilage molecular biomarkers, 34 out of 55 (62%) reported no effect and 4 out of 55 (7%) reported an increase, in favour of the interven-

tion group. Meta-analyses showed that exercise therapy seems to be associated with reductions of C-reactive protein, C-terminal crosslinking telopeptide of type II collagen, tumour necrosis factor alpha (TNF- α), soluble TNF- α receptor-1 and -2, C2C neoepitope of type II collagen and cartilage oligomeric matrix protein in comparison to the control group (21).

Clinical implications

Patients can be reassured that the exercise commonly prescribed to prevent or treat symptomatic knee osteoarthritis is safe for articular cartilage health.

Cartilage is a resilient tissue which has a unique 'self-stiffening' properties which allow its structure and composition to adapt over a wide range of loading magnitudes and frequencies (8, 11, 22, 23). These mechanisms allow the cartilage to resist daily dynamic loading activities (e.g. walking, running) without leading to detrimental effects on its macromolecules (i.e. aggrecan),

however loading magnitudes and frequencies above (i.e. overload) the safe loading range cartilage can tolerate or below it (i.e. under loading) can be both detrimental for cartilage health. This suggests that the load generated on cartilage by the exercise interventions in humans was within the loading range tolerated by cartilage. In animals instead, the extreme knee joint loading interventions: dogs running a marathon daily for one year (i.e. overload) and short bouts of exercise in caged animals (i.e. underload) caused detrimental changes to cartilage compared to an exercise dose between these two extreme interventions (e.g. 4 km daily of running).

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Context effect in exercise therapy

The role of the physical environment in treatment delivery

Louise Fleng Sandal

This article is based on elements from the Ph.D. thesis by Louise Fleng Sandal entitled "Influence of the physical environment on treatment effect in exercise therapy for knee or hip pain". The research originated from the Research Unit of Physical Function and Physiotherapy. Main supervisor was Prof. and Head of Research Ewa M. Roos, co-supervisors were Ass. Prof. Jonas Bloch Thorlund and Senior Researcher Andrew J. Moore and project collaborators were Prof. Roger S. Ulrich and Prof. Paul Dieppe. The results have been published in British Journal of Sports Medicine, DOI: 10.1136/bjsports-2016-097448 and in Osteoarthritis and Cartilage: DOI: 10.1016/j.joca.2015.11.002.

The burden of musculoskeletal disorders is increasing, in Denmark as well as internationally, and pain in the knee or hip is a major contributor. Clinical guidelines recommend exercise therapy as first-line treatment for knee and hip OA (1, 2). Large variation is seen in effect size of exercise therapy (3, 4). This variation may be caused by differences in exercise therapy programmes and populations. However, this variation may also be related to the fact that exercise therapy being performed in different physical environments and that these may influence patients differently (5).

Transferring knowledge from other research areas into exercise treatment

The physical environment can be viewed as a one of several factors that contribute to context effects (fig 1). Context effects are defined as the effects of a given treatment, not caused by the treatment directly, but, rather, the context that treatment is given in (5). From previous research, we know that the relationship between patient and practitioner is a potent factor that influence treatment outcome -although

this relationship is hard to standardize across health-care settings. On the other hand, the physical environment, i.e. the actual physical room where we give treatment is easier to standardize and manipulate. Also, we know from hospital environments that this is something that does influence health outcomes, patients, and clinicians,

both positively and negatively (6). The physical environment is well-studied in the hospitals, we know very little on its role in rehabilitation and exercise therapy settings. Therefore, we aimed to investigate the role of the physical environment as context factor exercise therapy as treatment for knee or hip pain.

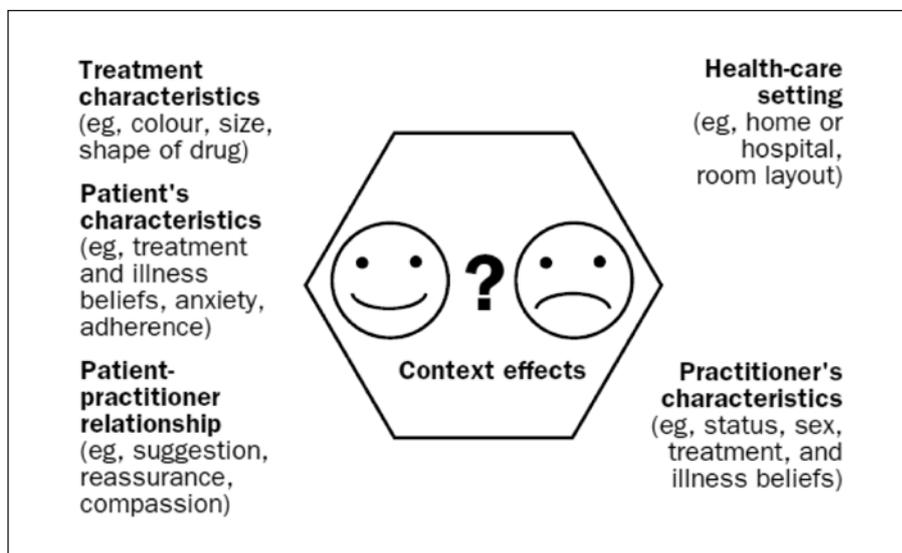


Figure 1. Categories of factors that may contribute to context effects (5). Reprinted with permission.



Figure 2. On the left-hand side, the contextually enhanced environment (EX+ROOM) and on the right-hand side the standard exercise environment (EX).

Does the physical environment affect exercise treatment?

In a randomised controlled double-blind trial (RCT), we randomised 103 participants in a 2:2:1 allocation to three groups: 1) the physically enhanced room (EX+ROOM), 2) the standard room (EX), and 3) the waiting-list (WL). In the EX+ROOM group 42 participants exercised in a newly build exercise environment with concrete walls and rubber floors, with a view overlooking an award-winning sport and recreational area (fig. 2). This exercise room felt new and modern. In the EX group 40 participants exercised in a standard environment, located in the baseline of the University. The room had wooden floors and wall bars, but appeared old and worn with damage walls and a pronounced smell of sweat and feet (fig. 2). The WL group, was a control group, here 21 participants were on a passive waiting list before receiving exercise therapy for their joint pain.

We recruited middle-aged individuals reporting persistent knee or hip pain within the past three months to the study. The intervention consisted of participants in the EX and EX+ROOM groups receiving the same eight-week, group-based neuromuscular exercise therapy programme, supervised by the same therapists, but performed in either the newly built contextually enhanced environment (EX+ROOM) or the standard old, unenhanced environment (EX). The primary endpoint was participants' global perceived effect (GPE) assessed on a 7-point Likert

scale at the eight-week follow-up. Also, a range of secondary patient-reported and objectively measured outcomes were evaluated before and after the intervention. Participants self-reported their joint pain on an 11-point numerical rating scale (NRS) before and after each exercise session.

How the physical environment contributes to treatment effect

The mean age of the study population was 58.5 years, 63% had knee pain as primary complaint, 61% were women and 88% reported joint pain for more than one year. As expected, participants who attended the exercise therapy gradually reduced their joint pain over the 8-week exercise period, with an 0.04 NRS decrease (95% CI 0.02 to 0.05, $p < 0.01$) per exercise session (fig 3, upper). Also, the size of participants acute exercise-induced pain flares decreased over the 8-week exercise period, with 0.04 NRS (95% CI 0.03 to 0.05, $p < 0.01$) per exercise session (fig. 3, lower). Consequently, the result showed that motivating participants to keeping with the exercise program despite initial pain flares will in the last result in pain relief. In contrast, the WL group, who did not receive any intervention, reported no change over the eight-week intervention period (-0.05 GPE, CI 95% -0.5 to 0.4).

When looking at the effect of the environment, we compared the treatment effect across the two exercise environments, we saw that participants exercising in the standard environment reported seemingly greater improvement

in GPE (0.98, CI 95% 0.5 to 1.4) than participants exercising in the contextually enhanced environment (0.37, CI 95% -0.2 to 0.9), $p = 0.07$). This was contrary to what we expected and to our a-prior hypothesis. However, the same trend in favour of the standard exercise environment over the contextually enhanced environment was seen in patient-reported secondary outcomes.

The participants experience of the exercise environments

In order to understand our results, that participants seemed to favour the old room over the new, we explored the experience and perception of participants and supervising therapists, a qualitative study was nested into the RCT. In semi-structured focus-group interviews (6 interviews, $n = 25$), participants from the standard environment stated that they felt at-home, experienced a strong sense of fellowship, and identified their own body image with the standard environment.

"From my perspective it is something that motivates [...] that there's a good atmosphere. And it is only there, when we feel comfortable and safe. [...] It has a contagious effect."
(participant from standard environment)

Contrarily in the contextually enhanced environment, participants did not describe a feeling of being at home or fitting into the environment, and their sense of being in a group was less pronounced or lacking. Consequently, the qualitative findings also supported the

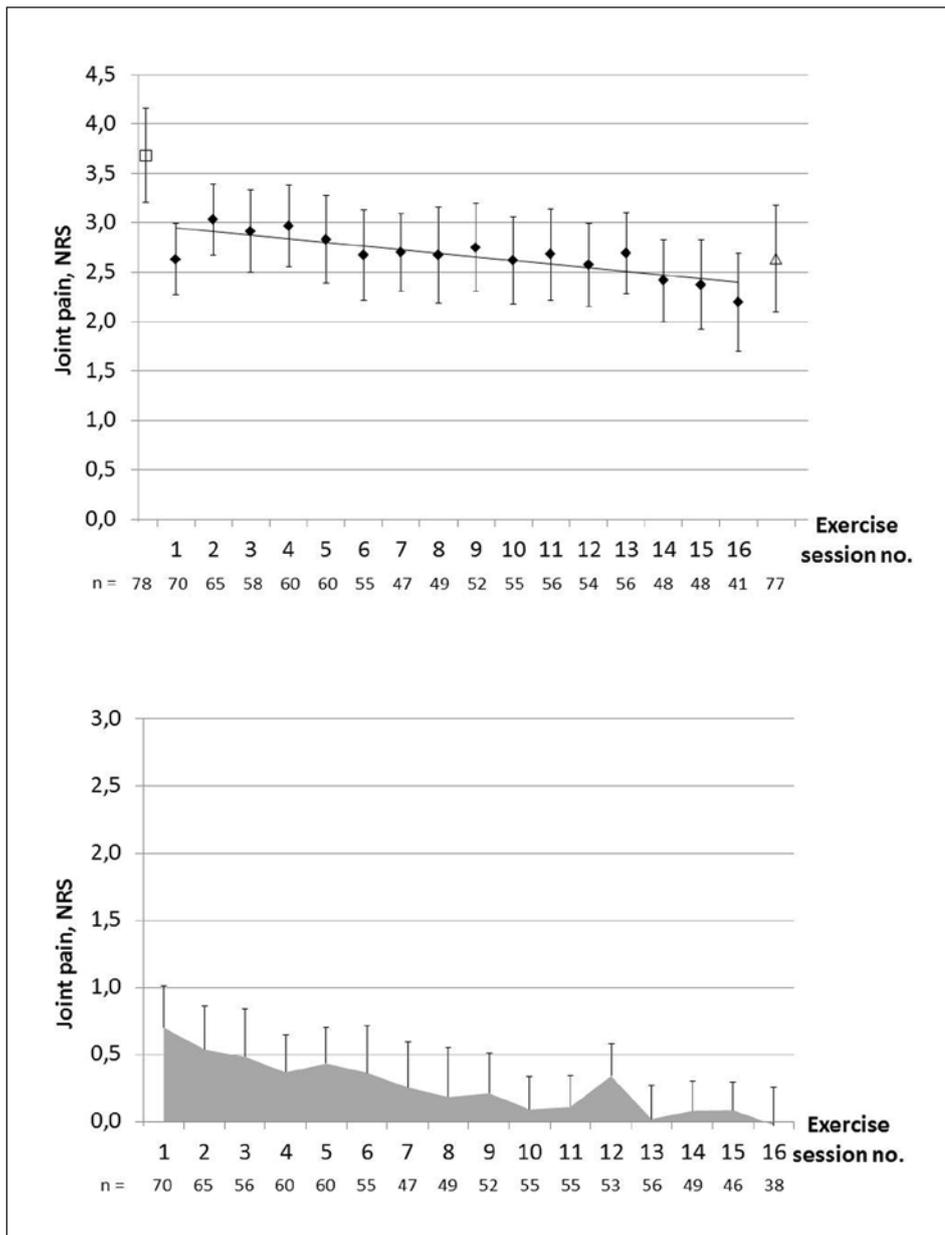


Figure 3. Upper panel shows the trajectory of self-reported pain before starting an exercise-session over the course of an 8-week period. The white, open square and triangle show the pain level before and after starting the exercise program. The lower panel shows the size of the pain flare caused by attending an exercise session (calculated as the pain after the session subtracted by the pain before the session).

trend seen in the study outcomes that the standard environment was favoured over the contextually enhanced.

Clinical implications

The results of this study indicated that the physical environment does seem to influence treatment effects from exercise therapy. This suggests that the physical environment is a contributor to context effects. Then from a clinical perspective, matching the physical environment in exercise therapy to the

preferences of the participants may result in enhanced self-reported treatment effects. Consequently, context factors can be described as a "toolbox of opportunities" that entails a range of medical, clinical, psychological, environmental, and social factors that can be used actively to maximize treatment response (7, 8). The potential in using context factors actively to enhance treatment effect is large and could be utilized in clinical perspective (7, 8).

Practical tips on how to create the "optimal" exercise environment

The recommendations for exercise environments originates from interviews with participants and therapists:

- *Mirrors* are used as a tool in exercise therapy to provide visual feedback to the patient. However, patients expressed insecurity and discomfort with the mirrors and would avoid standing in front of them while exercising. So, when using mirrors in your clinical practice, remember to explain the purpose of the mirrors and the motives for their use. Also, restrict mirrors to one wall, thereby making it possible for patients to use the mirrors actively, but also being able to move away from them again may be helpful.
- *Music* during exercise was perceived as a positive distraction and aided the social interaction between patients. If using music during exercise therapy, choose a sound level allowing conversation and verbal supervision, choose music appropriate for the age-group or allow patients to bring their own.
- *Finding your way* into the exercise room can be perceived as a barrier, especially when attending exercise for the first time. Be sure to give directions to the exercise and changing rooms and if possible walk there together with the patient. Also, patients find "way markers" on stairs, arrows on the floor and signs on doors helpful.
- *Feeling part of a group and feeling at-home* in the exercise room seems to be very important for patients. Factors that contributed to establishing this feeling may be aided by having an enclosed exercise room rather than an open space, by allowing participants to create routines (example: having set routines for starting and ending the exercise session), and by having fixed groups starting and ending the exercise therapy together and calling patients by first name.

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Challenges in interpreting patient-reported outcome measurement scores in elective knee surgery

– highlights from a PhD project

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Papers included in PhD-thesis:

I. Ingelsrud LH, Granan L-P, Terwee CB, Engebretsen L, Roos EM. Proportion of Patients Reporting Acceptable Symptoms or Treatment Failure and Their Associated KOOS Values at 6 to 24 Months After Anterior Cruciate Ligament Reconstruction: A Study From the Norwegian Knee Ligament Registry. *Am J Sports Med.* 2015;43(8):1902–7.

II. Ingelsrud LH, Terwee CB, Terluin B, Granan LP, Engebretsen L, Mills KAG, Roos EM. Meaningful Change Scores in the Knee Injury and Osteoarthritis Outcome Score in Patients Undergoing Anterior Cruciate Ligament Reconstruction. *Am J Sports Med.* 2018;46(5):1120–8.

III. Ingelsrud LH, Roos EM, Terluin B, Gromov K, Husted H, Troelsen A. Minimal important change values for the Oxford Knee Score and the Forgotten Joint Score at 1 year after total knee replacement Minimal important change values for the Oxford Knee Score and the Forgotten Joint Score at 1 year after total knee replacement. *Acta Orthop Scand.* 2018;Jun 4;1-7 [Epub ahead of print].

Patient-reported outcome measures

In recent years, emphasis has been placed on evaluating the effect of elective knee surgery from a patient-centered perspective. Patient-reported Outcome Measures (PROMs) have been developed to enable measurement of the patients' perspectives on own health state and treatment outcome (1,2).

Anterior cruciate ligament reconstruction evaluated with the Knee injury and Osteoarthritis Outcome Score

The Knee injury and Osteoarthritis Outcome Score (KOOS) is a widely used instrument to assess the outcome

of treatment for anterior cruciate ligament (ACL) injury in both clinical practice and research. The evidence of its reliability, validity and responsiveness characteristics is well supported (3). The KOOS includes five separately scored subscales: Pain (9 items), Symptoms (7 items), activities of daily living (ADL) (17 items), sport and recreation function (Sport/Rec) (5 items) and knee-related quality of life (QOL) (4 items). Each item is responded to on a 5-point Likert scale and a score ranging from 0 (extreme knee problems) to 100 (no knee problems) is calculated for each separate subscale (4,5).

Total knee replacement evaluated with the Oxford Knee Score and the Forgotten Joint Score

The Oxford Knee Score (OKS) was developed to evaluate the outcome of total knee replacement (TKR) in randomized controlled trials (6). The OKS contains 12 items regarding the degree of knee pain and functional limitations due to the knee problem. Each item is answered on a 5-point Likert scale, and all items are summed to a total score from 0 (extreme knee problems) to 48 (no knee problems) (7). The OKS has undergone rigorous clinimetric testing and was, in a recent systematic review, found to have good evidence of vali-

dity, reliability and responsiveness characteristics for use in patients undergoing a total knee replacement (8).

The Forgotten Joint Score (FJS) was developed more recently to evaluate patients' postoperative knee awareness after TKR, in other words, their ability to forget about their artificial knee joint in everyday activities. The FJS includes 12 items that are responded to on a 5-point Likert scale that are summed and converted to a total score ranging from 0 (high knee awareness) to 100 (low knee awareness) (9). The validity, reliability and responsiveness characteristics have been determined to be sufficient in patients undergoing knee replacement (9–11).

Interpreting PROM scores can, however, be challenging because statistically significant change scores are not necessarily clinically relevant or important to patients (Figure 1).

Longitudinal threshold values

Determination of minimal important change (MIC) values, the smallest degree of change that is deemed important by the average patient, may inform the evaluation of whether changes in PROM scores, from before to after treatment, are in fact clinically relevant (12,13). Several approaches to estimate MIC values have emerged during the past 30 years, which have resulted in large ranges of MIC values for specific PROMs as a consequence of methodological differences (12,14). Careful methodological consideration is therefore crucial when establishing MIC values. Two main approaches have been described: anchor-based methods and distribution-based methods. While there is still disagreement on the optimal MIC definition and methodology, there does seem to be some consensus in the literature that anchor-based methods are preferred over distribution-based methods, since the latter do not take the degree of importance of the change in scores into account (15).

Cross-sectional threshold values

While the MIC concept relates to 'how much better' patients are after treatment, the concept of Patient Acceptable Symptom State (PASS) relates to whether patients are 'feeling good'. The PASS concept was first described

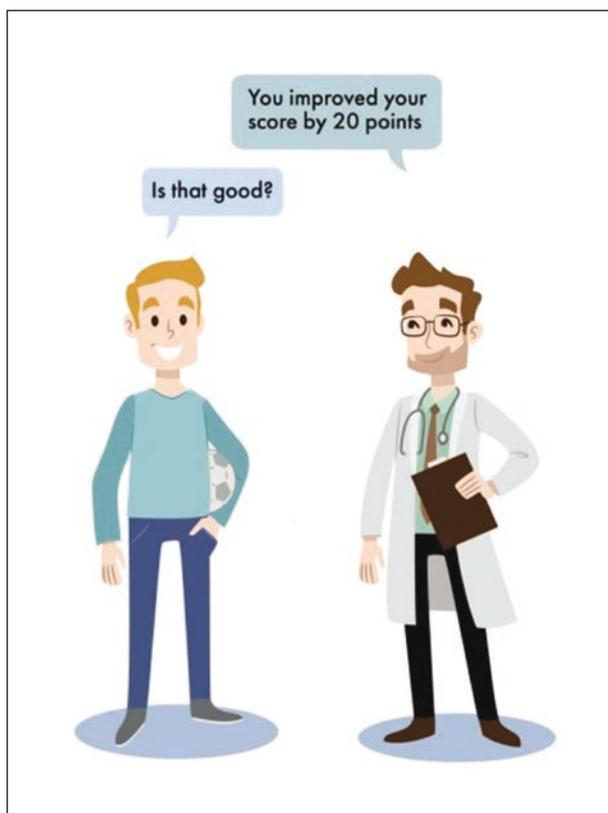


Figure 1. Interpretation of PROM scores are not straight forward. Designed by Freepik, redesigned by Birgit Hove. Source: <https://www.freepik.com>.

by Tubach et al. in 2005 who defined it as "the value beyond which patients consider themselves well" (16). After knee surgery, a PASS value therefore corresponds to the cross-sectional, post-operative PROM value where patients deem their symptom state as to be satisfactory. The PASS concept complements the MIC in the interpretation of results from clinical trials and cohort studies. Hence, postoperative PROM results may be presented with responder analyses, using the PASS value as a responder threshold (16). To estimate PASS values of a PROM, an approach similar to the anchor-based MIC method is applied that involves linking of the post-operative PROM score to an anchor question, where patients respond to whether or not they consider they have achieved a satisfactory level of symptoms (yes/no) (16,17). In contrast, treatment failure after ACL reconstruction was previously defined as having KOOS QOL scores below 44 points (18). This definition originated from a randomized controlled trial of ACL reconstruction, in which a KOOS QOL score <44 was used as a criterion for crossing over from the non-operative to the operative treatment arm (19). Whether that threshold corresponds to

the patients' own perceptions of what constitutes treatment failure is, however, unverified.

Aim of the PhD project

The aim of my PhD project was to determine longitudinal and post-operative cross-sectional interpretation threshold values for the Knee injury and Osteoarthritis Outcome Score (KOOS) at 6 to 24 months after undergoing anterior cruciate ligament (ACL) reconstruction and longitudinal threshold values for the Oxford Knee Score (OKS) and Forgotten Joint Score (FJS) at 12 months after undergoing a total knee replacement (TKR).

Threshold values were determined using register-based data

Two observational cohort studies were performed. Prospectively collected data on patients undergoing ACL reconstruction and TKR were collected through the Norwegian Knee Ligament Registry and the Copenhagen University Hospital Hvidovre local arthroplasty database, respectively. Anchor-based approaches were used to determine longitudinal MIC values in which the PROM change scores are anchored to patients' perceptions of

change after treatment (20,21). Patients were required to rate the degree and importance of change on subscale-specific anchor questions post-operatively. The primary analysis method was the newly described predictive modeling approach (MIC_{pred}) (22). The predictive modeling MIC values were adjusted for the large proportion of patients experiencing important improvements (23). Nonparametric bootstrap replications ($n=1000$) were used to determine 95% confidence intervals (CI) for unadjusted and adjusted MIC_{pred} values. We also investigated methodological challenges by comparing MIC values derived with the more traditional Receiver Operating Characteristic method (MIC_{ROC}) and the Mean Change method ($MIC_{MeanChange}$) (24,25). Cross-sectional, postoperative results for patients undergoing ACL reconstruction were investigated by asking patients whether they considered their symptom state to be satisfactory, and if not,

whether they deemed the treatment to have failed (26). Patients were classified as having satisfactory treatment outcome, deeming the treatment to have failed, or neither, by the responses to these questions. Mean KOOS values and 95% confidence intervals (CI) were calculated for each treatment response category.

MIC, PASS and TF threshold values

For determination of MIC for improvement values, complete follow-up data were achieved from 542 out of 1,197 (45.3%) patients undergoing an ACL reconstruction and 333 out of 496 (67.1%) patients undergoing a TKR. In patients undergoing ACL reconstruction, predictive modeling MIC values for each KOOS subscales (0 to 100, worst to best) were 12.1 for Sport and Recreational function and 18.3 for the knee-related Quality Of Life (Figure 2). MIC values obtained for the subscales

Pain (2.5), Symptoms (-1.2) and Activities of Daily Living (2.4) were consequently lower due to less room for improvement in these domains. In patients undergoing TKR, the predictive modeling MIC for improvement values were 7.6 for the OKS and 14.0 for the FJS. We found that the more traditional ROC methods yielded larger MIC values with larger confidence intervals. Additionally, the ROC MIC values were associated with large degrees of misclassification. Values obtained with the Mean Change method were considered less reliable because these values are derived from using scores from only subgroups of patients.

When categorizing patients into the three post-operative treatment response groups: satisfactory outcome (i.e. achieving PASS), treatment failure, or neither, we found that at 6, 12 and 24 months after ACL reconstruction, 55% to 68% of the patients rated their degree of symptoms as satisfactory, 7%

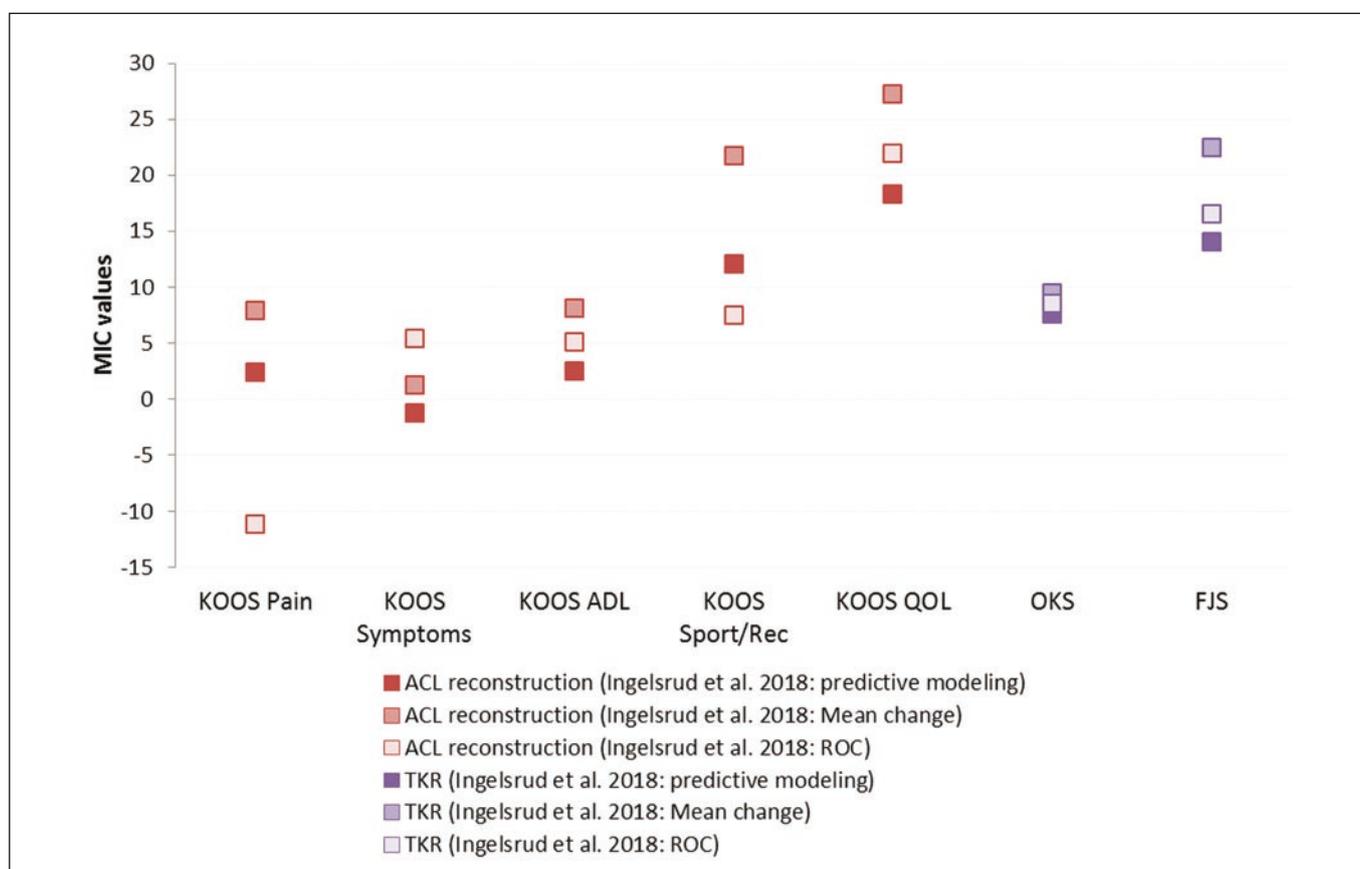


Figure 2. Minimal Important Change (MIC) values for the Knee injury and Osteoarthritis Outcome Score (KOOS) (0-100) in patients undergoing an anterior cruciate ligament (ACL) reconstruction and for the Oxford Knee Score (OKS) (0-48) and Forgotten Joint Score (FJS) (0-100) after a total knee replacement. MIC values were estimated with the predictive modeling method, adjusted for the high proportions of improved patients, the Receiver Operating Characteristics method and the Mean change method.

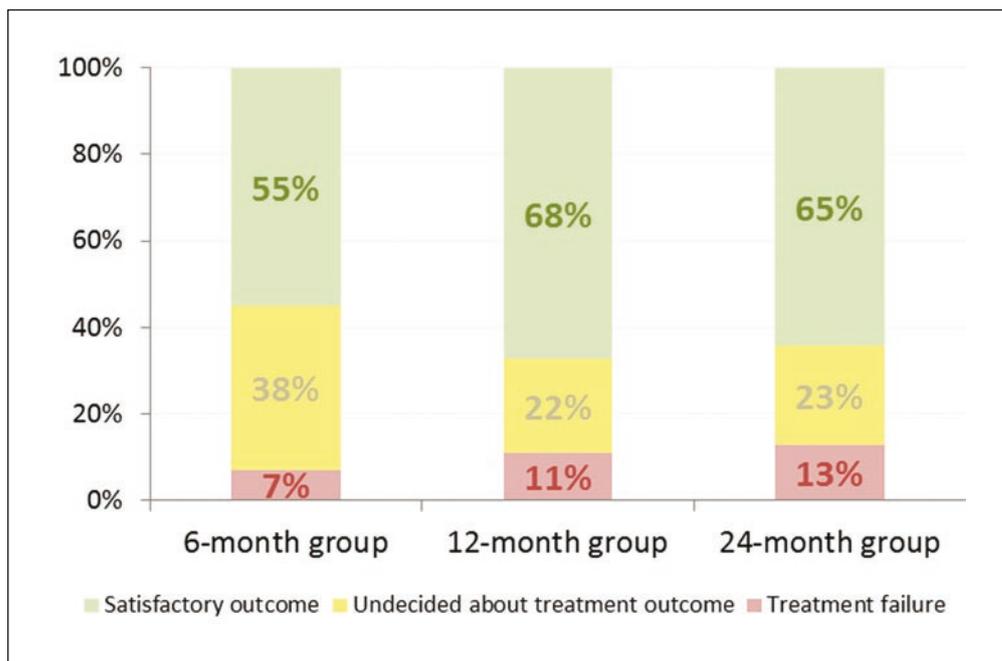


Figure 3. Percentages of patients experiencing their symptom level as being satisfactory, deeming the treatment to have failed or being undecided about treatment outcome at 6, 12 and 24 months after ACL reconstruction.

to 13% found their symptoms severe enough to consider their treatment to have failed, and the final 22% to 38% were undecided about their treatment outcome. The specific percentages for each follow-up time point are presented in Figure 3.

Across all three post-operative time points, the mean (95% CI) of post-operative KOOS subscale scores for patients with satisfactory symptom levels ranged from 82 to 96 (79; 97) for the subscales Pain, Symptoms and ADL, and from 69 to 77 (65; 81) for Sport/Rec and QOL. Patients who considered the treatment to have failed had the lowest KOOS scores for the subscales Sport/Rec and QOL, ranging from 24 to 33 (12; 43), and the highest for ADL ranging from 69 to 73 (55; 82). Their corresponding Pain and Symptom scores ranged from 55 to 58 (44; 71). Lastly, mean and 95% CIs in KOOS scores for patients who were undecided about treatment outcome were, in general, lower than patients with satisfactory symptoms and higher than patients deeming the treatment to have failed. Figure 4 presents the post-operative KOOS scores for patients at the 6, 12 and 24 months post-operative time points combined.

Context dependency of MIC values

MIC values are context-dependent and may therefore vary with factors such

as patient populations, treatment interventions and time to follow up. The MIC values from our studies varied largely across the PROM subscales investigated, and, in comparison to previously published MIC estimates. These findings are in line with those of King, who challenged the perception that there is one universal MIC value for PROMs in general, or even one MIC value that holds true for one spe-

cific PROM (12). Therefore, despite the attractive simplicity of having a single MIC estimate for a specific PROM, there may in fact be a range of MIC values for a PROM. Our findings support just that, since the MIC values that we estimated for the KOOS and OKS in our studies further increased the ranges of MIC values that were found in previous studies for these PROMs (Figure 5) (27–31).

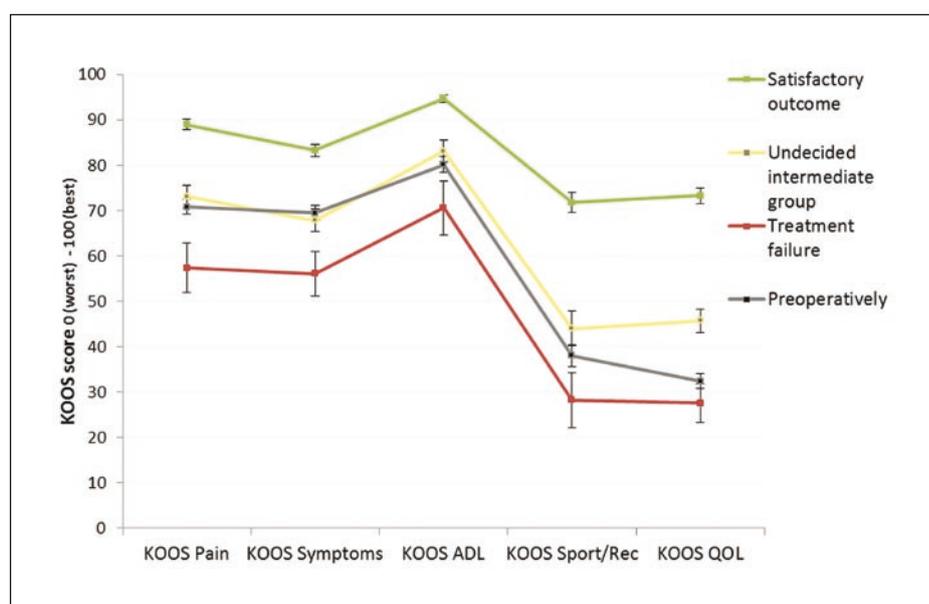


Figure 4. Mean KOOS scores for patients having a satisfactory outcome, deeming the treatment to have failed, or being undecided about treatment outcome at 6 to 24 months combined after ACL reconstruction. Error bars represent the 95% confidence intervals around the mean scores.

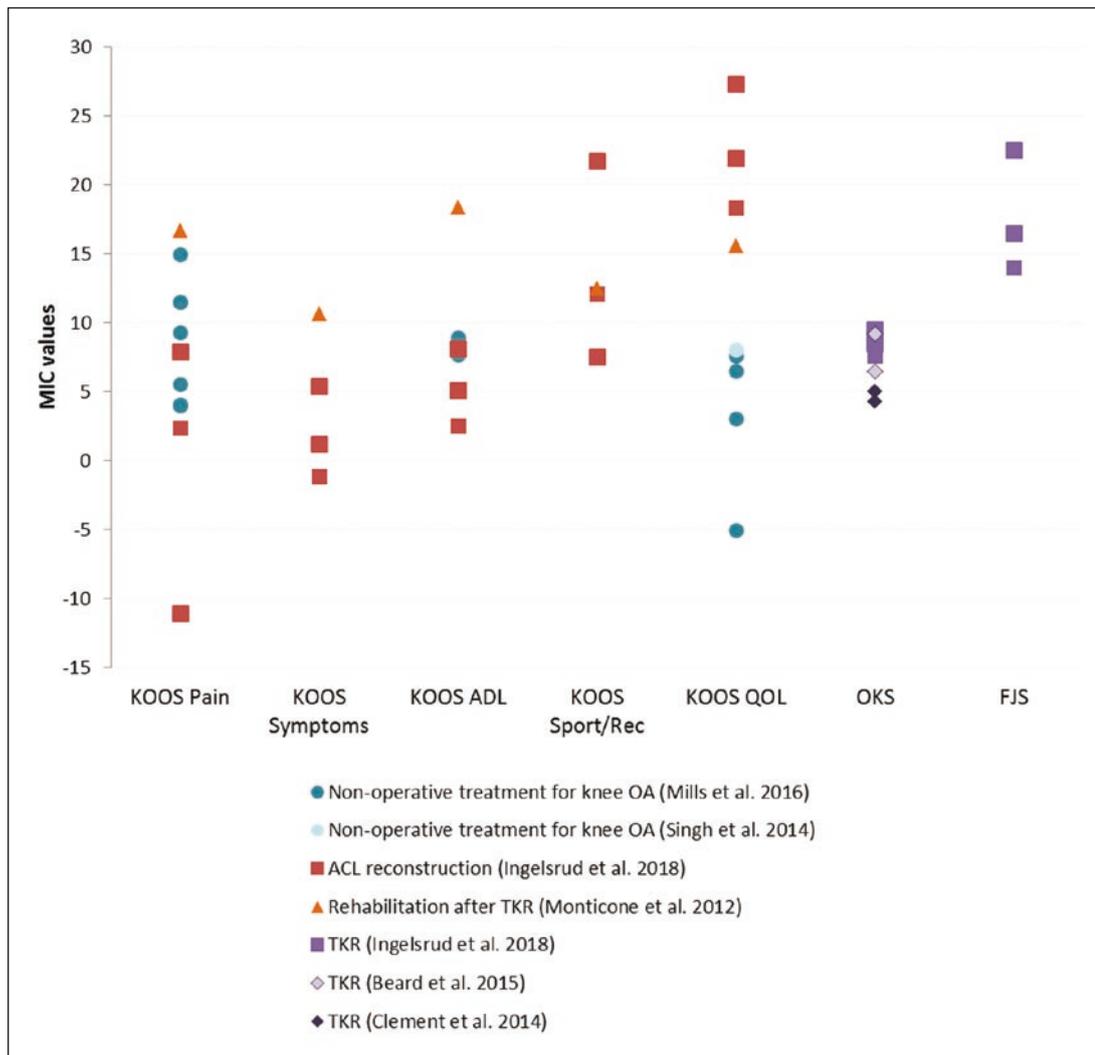


Figure 5. Ranges of MIC values for the KOOS (0-100, worst-best) for patients undergoing ACL reconstruction, non-operative management for knee osteoarthritis, and in-hospital rehabilitation after a total knee replacement, and for the OKS (0-48, worst-best) and FJS (0-100, worst-best), for patients undergoing a total knee replacement. The presented MIC values are published in the studies of Ingelsrud et al. 2018, Ingelsrud et al. 2018, Mills et al. 2016, Monticone et al. 2013, Singh et al. 2014, Beard et al. 2015 and Clement et al. 2014.

MIC values vary across three different anchor-based methods

We found the newly proposed predictive modeling method to be the more robust method to estimate MIC values. Across the different PROMs and subscales, the adjusted MIC_{pred} values had narrower 95% CI in comparison with all the $MIC_{MeanChange}$ values and all the MIC_{ROC} values for all but the KOOS QOL subscale, indicating that the predictive modeling method is more precise. Furthermore, the predictive modeling method allows adjustment for the upwardly skewed MIC estimates resulting from proportions of improved patients exceeding 50%. The adjusted MIC_{pred} values were smaller in comparison with all the $MIC_{MeanChange}$ values and all the MIC_{ROC} values for all but the KOOS Pain and Sport/Rec subscales (Figure 2). The $MIC_{MeanChange}$ values were larger than those esti-

mated with predictive modelling and ROC, across all PROMs and subscales, which implies that the mean change method overestimates the threshold for a minimally important improvement. To define responder thresholds, the ROC method is considered more appropriate because the MIC_{ROC} value is defined as the point with the least degree of misclassification (32). However, when investigating the KOOS MIC_{ROC} values further, we found that the magnitude of misclassifications was large, judged by the degrees of sensitivity and specificity associated with the best ROC cut-off points. Furthermore, the cut-off points seemed arbitrary, since the degrees of misclassification, hence the discriminatory power, were more or less the same within the wide 95% CI around the cut-offs, which can also be deduced from the generally flattened ROC curves. These MIC_{ROC} va-

lues do not, therefore, qualify as good threshold values for important improvement. In line with previous research (14), our results indicate that triangulation with different MIC methods does not result in narrow MIC ranges, but results in large ranges of MIC values for each PROM subscale (Figure 5).

Satisfactory post-operative symptom level after ACL reconstruction

The proportion of patients deeming their symptom level to be satisfactory at 6 to 24 months after ACL reconstruction ranged from 55% to 68%, which is a more positive result than previous findings from the Swedish National Knee Ligament Registry. In the Swedish study, only 20% were classified as being functionally recovered at 2 years after ACL reconstruction (18). Barenius et al. defined the functional recovery threshold as having achieved

post-operative KOOS scores that correspond to the lower 95% CI around the mean population values for men in the age group 18-34 years (33). Applying these criteria to our cohort resulted in only 17% of patients achieving a positive outcome at 6 to 24 months after surgery. In comparison with Barenius et al.'s functional recovery thresholds, our mean PASS values were similar for Pain, Symptoms and ADL, but about 10 points worse for Sport/Rec and QOL. Additionally, consensus criteria for PROMs of 85-90 were established by Lynch et al. in 2015 to classify patients as having a successful outcome of treatment after ACL injury (34). Our mean PASS values are in a similar range for the subscales Pain, Symptoms and ADL, but again about 10 points lower for the subscales Sport/Rec and QOL. Therefore, both the functional recovery thresholds used by Barenius et al. and the consensus thresholds of Lynch et al. might be too optimistic for the constructs of sport and recreational function and knee-related quality of life after ACL reconstruction. In comparison, Muller et al. (35) defined PASS threshold values for the KOOS at 2 years after an ACL reconstruction using ROC statistics. Their PASS threshold values were similar to our mean PASS values for Pain, ADL and Sport/Rec, about 30 points lower for Symptoms, and 10 points lower for QOL. Differences in methodological approaches to define PASS values might describe some of the discrepancies between these results.

Treatment failure

Patients may deem the treatment to have failed even though they do not eventually have revision surgery. In the Scandinavian registries, the overall revision rate was reported to be 3.6% across ACL graft types 1 to 5 years after ACL reconstruction (36). However, in our study, approximately 10% of the patients deemed the ACL reconstruction to have failed at 6 to 24 months post-operatively. Therefore, our results suggest that only reporting revision rates leads to an excessively positive conclusion of the risk involved in ACL reconstruction. Furthermore, we found that the post-operative mean KOOS scores were smaller than pre-operative values for all five subscales. This find-

ing indicates that the patients who deem the treatment to have failed after ACL reconstruction are not just experiencing lack of improvement; they actually experience worse pain levels and deterioration in knee function (Figure 4). Asking the patients directly about their perception of treatment failure leads to a more nuanced investigation of treatment failure than the traditional evaluation of revision rates.

Conclusions and clinical implications of findings

The established MIC values for the KOOS, OKS and FJS can aid in interpreting within-group score improvement over time and can be used when comparing responders to treatment between groups in comparative studies of elective knee surgery. Using PASS and TF values as responder criteria may further improve the interpretation of postoperative PROM scores as these values better reflect how satisfied patients are with their postoperative treatment outcome.

The PROM interpretation threshold values are context-specific and subscale-specific. Hence, the proposed values are therefore considered applicable in contexts and patient populations that resemble the characteristics from our populations under study. Furthermore, different methodological approaches result in large differences in interpretation estimates. Clear definitions of the interpretation concepts and careful methodological considerations are crucial to arrive at reliable and robust interpretation threshold values.

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NSAIDs use in athletes

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Introduction

Non-steroidal anti-inflammatory drugs (NSAIDs) are among the most frequently prescribed drugs worldwide, also in the field of musculoskeletal disorders and sports injuries. The main purposes for prescribing and using NSAIDs are reduction of pain and inflammation. There are various reports indicating that athletes regularly take NSAIDs (1-4). NSAIDs are taken in order to manage traumatic or post-traumatic (musculoskeletal) pain, but there are also reports of prophylactic use of NSAIDs in athletes. In this case NSAIDs are taken in order to prevent pain and inflammation before the (presumed) onset (2).

There is a wide variety of different NSAIDs available. NSAIDs are non-selective inhibitors of (cyclo-oxigenase) COX 1 and COX 2. COX 1 inhibitors (brand names include diclofenac, ibuprofen, naproxen) are used since many years, but often cause gastro-intestinal and other side effects and interactions. The so-called Coxibs are selective inhibitors of COX-2 which are associated with less gastro-intestinal adverse events, but higher risk of cardiovascular events are seen in some populations (5,6). The widespread use of NSAIDs among athletes raises questions on the risk-benefit ratio. Do the benefits outweigh the risks of adverse events? This article will focus on NSAID usage among athletes, professional and non-professional and will discuss the findings in relation to the benefits and risks.

Methods

A literature search was conducted using Medline covering the last 15 years (key-words: NSAIDs (use), Athletes, Sports) in order to identify relevant studies. The full papers of potential relevant studies were retrieved and included if the study reported NSAID use in athletes, either professional on non-professional. The reference lists of included studies were screened for potential additional relevant studies (snowballing). Data on the study population, definitions, measurement instrument being used and reported NSAID use were extracted and summarized.

In addition to this literature overview we analyzed NSAID use in a recent randomized controlled trial (N=2378) among Dutch recreational runners who registered for a running event (distances 5 km up to 42.195 km) (7). A total of 883 runners (37.1%) sustained a new injury during follow-up. All injured runners were asked whether they took any medication and if so, what type of medication they used (free text). Type of medication was consequently categorized into 'paracetamol', 'NSAIDs', 'opioids' and 'other'.

Data on efficacy, especially regarding pain reduction, and side-effects of NSAIDs were derived from the current Cochrane reviews on efficacy of NSAIDs for musculoskeletal conditions: lateral elbow (tennis elbow), chronic low back pain, sciatica, acute musculoskeletal pain, chronic musculoskeletal pain, acute soft tissue injury.

Results

We identified 16 studies reporting NSAID use in athletes (Table 1). Most studies were conducted among professional athletes, especially in top-athletes e.g. participating in the Olympic games or FIFA (football) World Cup. However, there were also studies available that focused on amateur athletes. Studies were carried out in various countries around the world, mostly in western countries. Few studies made efficient use of the availability of doping forms reporting medication use, which participating athletes of the Olympics and FIFA world cups were obliged to report. NSAID usage was defined differently between the studies especially regarding the time-interval of usage that varied from 24 hours before the (running) event, 72 hours before the start of a match, to the previous 7 days, previous 3 months and previous 12 months. Usage was commonly measured by self-report using questionnaires or interviews.

NSAID use in athletes reported in literature

Reported use in the previous 12 months is almost 100% in some studies (11,18). Proportion of athletes reporting NSAID use in the previous 3 months are up to 60% -75% (8, 14). Even if shorter time-intervals are considered (24 – 72 hours before the event) 32%-35% of the athletes report use of NSAIDs (15, 23). Overall, more than 50% of players report the use of NSAIDs during a tournament like FIFA world cup (15)

Table 1. Studies reporting NSAID-use in athletes

Author (year)	Study population (n)	Definition used / measurement instrument	Reported NSAID use	Comment
Warner (2002)	Student athletes/ football players (n=618)	NSAID use in past 3 months/ questionnaire	75%	15% were daily users
Corrigan (2003)	Athletes selected for doping control Sydney Olympics (n=2758)	Question regarding medication use in past 3 days	25.6%	
Huang (2006)	Canadian athletes in Olympic Games Atlanta (n=257) and Sydney (n=300)	Personal interviews regarding use of supplements and medication	33.5%-39.3%	Highest in softball (60%) and Gymnastics (100%)
Taioli (2007)	Italian Professional soccer players (n=1041)	Questionnaire, including anti-inflammatory analgesics use in the past year	92.6%	
Tscholl (2008)	Male top-level football players prior and during FIFA world cups 2002 and 2006	Medication use documented by team physician	> half of players used NSAIDs during tournament and 30.8% prior to a match	NSAIDS were the most frequently prescribed substance
Van Tuyne (2008)	Doping control forms of athletes in various sports in Belgium and the Netherlands (n=18645)	Declared use of medication	NSAID use varies between 1 % and 30 % depending on the type of sport	Highest use in volleyball, soccer, basketball and tennis
Gorski (2011)	Participants Brazil Ironman 2008 (triathlon) (n=327)	Questionnaire; use of NSAIDS past 3 months	59.3%	25.9% day before, 17.9% immediately before, 47.4% during the race. + little knowledge about (adverse) effects
Tscholl (2012)	Professional football players participating in 2010 FIFA World Cup in South Afrika (n=736)	Use of prescribed medication by each player during the 72 hours preceding each match	34.6% of players used at least one NSAID before match. 54.8% used NSAIDS during the tournament	
Kuster 2012)	Participants at the 2010 Bonn Marathon (n=3913)	Questionnaire/analgesic consumption before the (half)marathon	Nearly half of the respondents used analgesics (mostly NSAIDs -diclofenac and ibuprofen)	Incidence of adverse events was higher (16%) in group taking analgesics compared to group not taking analgesics (4%)

Aavikko (2013)	Finnish Paralympic athletes (PA) (n=92) and Olympic athletes (OA) (n=372) in 2006 and 2009.	Questionnaire regarding the use of physician-prescribed medication in the previous 7 days and previous 12 months	7 days: PA (16.3%) OA(1.8%) 12 months PA (34.8%) OA (48.7%)	
Holmes (2013)	American College Football players (n=210)	Questionnaire including current and past use of NSAIDs	95.7 had used NSAIDs	50% reported high use (daily weekly use) during the season; 14.6% high use during the off-season
Vaso (2015)	Professional football players participating in 2014 FIFA World Cup in Brazil (n=736)	Use of prescribed medication by each player during the 72 hours preceding each match, documented by team physician/	30.6% of players used NSAIDs per match. 54.2% of players used NSAIDs during tournament.	
Pedrinelli (2015)	Top-level male futsal players during 2000, 2004, 2008, 2012 FIFA futsal world cups (n=1064)	Use of prescribed medication by each player during the 72 hours preceding each match, documented by team physician/	% of players taking NSAIDs prior to a match (23.9%-30.4%) % of players taking NSAIDs during tournament (43.8%-49.1%)	
Locquet (2016)	Female amateur runners, 10 or 21 km in Liege, Belgium (n=136)	Questionnaire regarding self-administration of medicines within 24 hours before a running event	14% used an NSAID (Ibuprofen)	Substudy of Locquet 2016b)
Locquet (2016b)	Amateur runners, 10 or 21 km in Liege, Belgium (n=358)	Questionnaire regarding self-administration of medicines within 24 hours before a running event	31.3% had taken self-medication, mainly to reduce pain (in 36.1%) for which they used Ibuprofen	
Fernando (2017)	Sri Lankan national level athletes (n=209)	Interviewer administered questionnaire regarding self-medication in previous 3 months	NSAID use was reported by 15.7 %	Athletes also report self-medication of herbal/traditional medicines

but also more than 50% of participants at a marathon report the use of analgesics (mostly NSAIDs) (16).

Not all studies report the frequency and or dosage of the NSAID use. However, Warner et al. reported that of the 75% student athletes who self-reported NSAID use in the past 3 months, 15% were daily users (8). American College Football Players also reported high use of NSAIDs, defined as daily or weekly use, in 50% of the players during the season. In the off-season the percentage reporting high use was still 14.6% (18).

The studies presented in Table 1 do not indicate that NSAID use in athletes is declining over time. The studies are ranked in order of appearance in the literature and the more recent studies show about the same prevalence of NSAID use as the earlier conducted studies. This observation is in line with the 2012 paper by Tscholl and colleagues entitled 'abuse of medication during international football competition in 2010 – lesson not learned'. They hint on the fact that despite previous reports of high use of NSAIDs among athletes, not according to clinical guidelines, the use of medication and especially NSAIDs remained high in the 2010 football tournament (15). To date there are no indications, however, that this situation has changed for the better. There is one recent study with a relative lower self-reported usage of NSAIDs by professional athletes performed in Sri-Lanka (self-reported use in 15.7% of the athletes within the past 3 months). The authors also noted that this percentage is much lower than in western populations and this may well be due to economic and cultural differences, which need further study (24).

NSAID use in Dutch recreational runners

Data of the injured runners (N=883) showed that 12.7% (N=112) used medication for their running related injury. Of these, 65.2% (N=73) used NSAIDs, 25% (N=28) used paracetamol and 9.8% (N=11) opioids. Of those using NSAIDs, knee injuries were the most frequent cause of complaints (27.4%), followed by hip (21.9%) and back injuries (21.9%).

Efficacy of NSAIDs in musculoskeletal conditions

Table 2 summarizes the evidence of NSAIDs for pain reduction in common acute and chronic musculoskeletal disorders. The six available Cochrane reviews cover the following musculoskeletal conditions: lateral elbow (tennis elbow), chronic low back pain, sciatica, acute musculoskeletal pain, chronic musculoskeletal pain, acute soft tissue injury. The evidence is mainly focused on the comparison of NSAIDs with placebo and in one study (i.e. acute soft tissue injury) mainly with paracetamol. Some reviews focused exclusively on topical NSAIDs (27,28) and others on oral or a mix of oral and topical NSAIDs (24-26, 29). We summarized the evidence on pain reduction. Outcomes on reduction of inflammation are seldom reported in the trials and consequently, seldom in the reviews.

The reviews indicate that NSAIDs show significantly more short term pain reduction compared to placebo in patients with tennis elbow, chronic low back pain and in acute and chronic musculoskeletal pain. At the same time the magnitude of effects are generally small (e.g. about 1.6 points difference on a 0-10 scale or 7 points difference on a 0-100 point scale). All reviews report that the quality of the evidence varies from very low, to low or moderate. Strong evidence was not reported in any review. In people with sciatica, NSAIDs had not a significantly better effect regarding pain reduction compared to placebo (based on low quality evidence) and in people with acute soft tissue injury NSAIDs the effect was not significantly better than other oral analgesics, including paracetamol (based on very low to low quality evidence).

In short, NSAIDs show some efficacy regarding pain reduction compared to placebo at short-term, but the magnitude of the effect is small. The effect is not apparent in all musculoskeletal conditions and it is unclear if NSAIDs are significantly better pain relievers than paracetamol.

Adverse-events

In general, small differences in the frequency of adverse events reported between the NSAID- and placebo

groups were found in the selected systematic reviews (Table 2). Reported adverse events are usually mild and transient. The quality of the evidence is low to moderate; no strong evidence is reported in any of the reviews. The clinical trials included in the review were not primarily designed to investigate the occurrence of adverse events associated with NSAIDs. The sample sizes are generally small in order to detect the more rare, but serious, adverse events and also the follow-up period in the trials is usually very short. From other reviews covering the increased risk of adverse events of NSAIDs there is good evidence that NSAIDs (also the Coxibs) are associated with an increased risk of heart failure (5) and myocardial infarction (6), stroke (30), gastrointestinal complications (31), acute kidney injury (32) and venous thromboembolism (33).

Discussion

Self-reported NSAID use is very high in professional and recreational athletes. The percentages of athletes reporting the use of NSAIDs in the previous 3-12 months are above 50% and sometimes even 100%. Usage during tournaments is also frequent, as more than 50% of football players report using NSAIDs. Valid data on dosage, frequency and duration of NSAID use is not widely available but some studies report that some athletes are daily users. This observation is not new, but of importance is that there are no indications that NSAID use in athletes is diminishing over time.

Data are mostly collected in western countries. The limited data from Sri Lanka concerning professional athletes indicate that the use may be somewhat lower than in western countries but still 16% of the athletes reported NSAID use in the previous 3 months.

The Dutch data on recreational runners show that about 13% of the runners with a running related injury use medication, mostly NSAIDs. This proportion is relatively lower compared to professional athletes, but given the popularity of running, the absolute number of runners, including those with running related injuries, is very high.

The beneficial effect of NSAIDs for reducing pain intensity for musculo-

Table 2. Efficacy and adverse events of NSAIDs for musculoskeletal disorders

Author (year)	Musculoskeletal condition	Main outcome	Adverse events
Pattanittum (2013)	Lateral elbow	Low quality evidence topical NSAIDs more short term pain reduction vs placebo. Mean difference -1.64 (-2.42, -0.86) on 0-10 scale.	Mild adverse events (rash) 2.5% NSAIDs 1.3% placebo
Enthoven (2016)	Low back Pain (chronic)	Low quality evidence NSAIDs more short term pain reduction vs placebo. Mean difference -6.69 (-10.74, -3.19) on 0-100 scale.	Adverse events not more frequent in NSAID group RR 1.04 (0.92- 1.17)
Rasmussen-Barr (2016)	Sciatica	Low quality evidence NSAIDs not significantly more pain reduction vs placebo. Mean difference -4.56 (-11.11, 1.99) on 0-100 scale.	NSAID associated with higher risk for adverse events. RR 1.40 (1.02, 1.93)
Derry (2015)	Acute musculoskeletal pain	Clinical success (e.g. 50% pain reduction was higher in NSAID group versus placebo RR varies between 2.2 (1.7, 2.8) and 3.4 (2.7, 5.5) depending on type of topical NSAID	No difference between NSAID and placebo regarding local and systemic adverse events (RR around 1.0)
Derry (2016)	Chronic musculoskeletal pain	For diclofenac and ketoprofen, about 6 people out of 10 with osteoarthritis had much reduced pain after 6 to 12 weeks, compared with 5 out of 10 with placebo (moderate quality evidence). RR varies between 1.0, 1.1, 1.2, 1.8 depending on type of topical NSAID	Moderate evidence that (mild) skin reactions were more common (20 in 100) with topical diclofenac than topical placebo (5 in 100). No difference between topical ketoprofen and placebo.
Jones (2015)	Acute soft tissue injury	low- or very low-quality but consistent evidence of no clinically important difference in analgesic efficacy between NSAIDs and other oral analgesics.	Low-quality evidence of more gastrointestinal adverse effects with non-selective NSAID compared with paracetamol.

skeletal pain has been shown in placebo-controlled studies, but the effects are relatively small. Differences in effect between NSAID and placebo do not exceed 2 point on a 0-10 scale. The clinical relevance of these effects may therefore be considered minimal. This is especially of importance regarding the fact that NSAIDs are not harmless with respect to their associated risk of adverse events. The increased risk for gastro-intestinal adverse events is well known, but there is now also better insight in the increased cardiovascular risks and kidney problems reported in people using NSAIDs. It is also well recognized that the risk of adverse effects

increases with long-term use. There are also indications that athletes are not well informed about the potential risk for adverse events (13). This might partly be due to the fact that NSAIDs are easily available over the counter, which may give the impression that they are harmless. A short period of NSAID use should probably not cause a lot of problems, as indicated in the trials evaluating NSAIDs in the Cochrane reviews, but long term (daily) use may not be harmless.

We conclude that it is important to educate the public, athletes and physicians that current NSAID use among professional and recreational athletes

is too high. Given the modest effect of NSAIDs regarding reduction of pain and contrarily the associated increased risk for adverse gastro-intestinal, cardiovascular and renal events especially their long term- and daily use should be prevented.

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A call to action: Manglende indsats fratager vores unge idrætsudøvere muligheden for at være fysisk aktive gennem livet

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I takt med tidens politiske prioritering af forebyggelse og sundhedsfremmende tiltag har man i de senere år haft et øget fokus på at komme negative trends som rygning, diskriminering, overvægt og trafikale ulykker til livs. Særlige tiltag rettes mod børn og unge i form af kampagner mod eksempelvis inaktivitet, overvægt og mentale lidelser som ensomhed og mistrivsel (1). De danske idrætsarenaer, der repræsenterer omkring 3.850.000 danskere, har muligheden for at spille en central rolle i at nå dette formål (2). Det er derfor et paradoks, at tolerancen for selv at dyrke eller lade sit barn dyrke helbredsskadelig træning i forbindelse med idræt fortsat er urovækkende høj. Situationen alvorliggøres af flere faktorer.

Misforstået høj tolerance for skader

Håndbold og fodbold er nogle af de mest populære idrætsgrene i Danmark med omkring 284.000 udøvere under 19 år (2). Det er alment kendt at det at dyrke den type af idræt udgør en risiko for skader. I en nylig artikel på dr.dk fremgår det, at korsbåndsskader er blevet en del af normen i dansk kvindehåndbold (3). Underligt nok har dette ikke hidtil ført til en offentlig

debat om de helbredsmæssige konsekvenser af alle disse skader, både på individniveau men også for samfundet. Tværtimod har mange spillere den opfattelse, at det ikke er noget problem at få og komme tilbage efter en korsbåndsskade, fordi det er noget alle får. Fordi sådan har det altid været. Det er ildevarslende. Og man bør undre sig, fordi historien og forskningen har vist, at kun mellem 50 og 80% kommer tilbage til idræt efter en korsbåndsskade (4-6). Hvad er årsagen til denne urovækkende holdning? Og ikke mindst, hvor er tiltagene for at komme denne holdning til livs?

Unødvendig høj risiko

Måske skyldes denne urovækkende holdning manglende kendskab til, at den høje risiko for knæskader kan halveres (7-12). Uden grundlæggende kendskab til optimal træningsjustering og anvendelse af forebyggende træningsprogrammer løber idrætsudøvere en betydelig helbredsrisiko. Forskningen er utvetydig. Studier inden for flere idrætsgrene har demonstreret, at det er muligt at reducere antallet af alvorlige knæ- og ankelskader ved helt simple tiltag som 10-15 minutters forebyggende træning 3 gange om ugen (7-12). Med andre ord en minimal indsats

i praksis. Alligevel er det ikke lykkedes at få dette opløftende budskab ud til de centrale aktører i sporten på en måde, så resultaterne tages alvorligt. Konsekvensen er at alt for mange idrætsudøvere har en nødvendig høj risiko for skader.

De unge udøvere rammes

Situationen alvorliggøres af, at korsbåndsskader især rammer de unge idrætsudøvere mellem 15 og 20 år (13). For nogen betyder det, at de må slutte med den idræt de elsker, og de bliver hermed forhindret i at deltage i en vigtig social arena, hvor mange har sine venner og sociale netværk. Dette kan medføre et tab af identitet og have en stor betydning i en sårbar fase i livet (14). Derudover vil en alvorlig knæskade for mange medføre en kaskade af senvirkninger som følge af tidlig udvikling af artrose, som meget få indenfor idrætsverdenen snakker om og måske har kendskab til.

Konsekvenserne af at idrætsskader underkommunikeres

Fakta er, at der i dag ikke findes en behandling som kan garantere, at du som udøver kommer tilbage til det niveau, du var på før din korsbåndsskade (4-6). Hvad værre er, at der heller ikke findes

behandling som kan reducere de langsigtede konsekvenser i form af tidlig udvikling af artrose, som typisk rammer 10-15 år efter en alvorlig knæskade som en korsbåndsskade (15-17). Det vil sige, at unge idrætsudøvere med en alvorlig knæskade som 15-årige kan risikere at have artrose når de er 25 år. At starte et liv med artrose som 25-årig har for mange enorme konsekvenser i form af konstante smerter og fysiske begrænsninger, der har toneangivende indvirkning på din livsudfoldelse i såvel fritid og arbejdsliv. Det medfører mange afsavn, som unge i den alder ikke burde tænke på. Fritidsaktiviteter du ikke kan deltage i, begrænsede arbejdsområder du kan arbejde indenfor, lege med dine børn, som du må afholde dig fra. En tilstand der ofte forværres med årene, da artrose ikke kan kureres. Et liv med artrose medfører for mange derfor invaliditet og et liv i behandling og træning for at holde symptomerne i skak og for at forhale symptomudviklingen. Det bliver herved som artrosepatient ofte svært at efterleve Sundhedsstyrelsens anbefalinger om fysisk aktivitet. Alt det har naturligvis betydende omkostninger for såvel den enkelte som for samfundet.

Omfanget af problemet usynliggøres

I alle situationer i samfundet er børns helbred øverste prioritet for alle vores indsatser. Der er en fælles forståelse for, at børn skal have den bedste start på livet og på sigt blive gode, stabile samfundsborgere. I idrætsverdenen derimod opleves en overfokusering på præstation. Udøvere hylides når de bidrager til sejr, men glemmes når de ryger ud med skader. Skadede spillere er nemme at erstatte med nye. Især når skaderne rammer børn inden de er elitespillere og derfor er udenfor mediernes og forbundets søgelys. Det er en bekymrende etisk værdi, som er med til at usynliggøre omfanget af problemet for selve idrætten, og efterlader den skadede spiller alene tilbage med sin kaskade af konsekvenser.

Det er de voksne, der har ansvaret

Skader og deres konsekvenser er der ingen børn og unge der tænker på, og det skal de heller ikke. De skal være trygge ved, at de voksne er klare over

skadesrisikoen og handler ud fra den viden. Blandt andet ved at sørge for at den idræt, som de er ansvarlige for, eller sender deres børn til, er et sted hvor tiltag for at reducere risikoen for skader prioriteres. Det er et barns ret.

Trenden ser desværre ud til at være det modsatte. Det er mit indtryk at mange trænere, selv i ungdomsidræt, har fokus på her og nu-præstationer på bekostning af skadesforebyggende træning og udvikling af det hele menneske. Gennem deltagelse på både senior- og ungdomshold, og for nogen på college eller efterskole, sættes de unge spillere gang på gang i situationer de fysisk og mentalt ikke er forberedt på. Det er en uacceptabel måde at spille hasard med børn og unges helbred på.

Samme tendens til fokus på præstationer ses også hos mange forældre, der har urimeligt høje ambitioner på deres børns vegne. Ambitionerne kommer til at skygge for deres allervigtigste rolle som forældre, nemlig at varetage barnets tarv.

Der er naturligvis også en del børn og unge, der udelukkende går til idræt på grund af det sociale. For dem er idræt en form for leg, hvilket muligvis kan blive en sovepude for den ansvarlige voksen. For skaderne ses også her, og de langsigtede konsekvenser er de samme, hvad enten du spiller for at blive elite eller for sjov.

Uanset idrætsarena er det trænerens, forældrenes og andre voksne omkring den unge udøver, der er ansvarlige for, at der bliver taget de nødvendige tiltag for børns fremtidige helbred. Personligt er mit succeskriterium at finde en klub, hvor jeg ved de prioriterer mit barns helbred og sociale udvikling forud for præstation og sejr. Jeg er overbevist om, at den tilgang skaber de bedste udøvere og resultater på sigt, hvis det er målet med idrætsdeltagelsen.

Ansvarlige aktører – hvad gør de, og hvad gør de ikke

Store organisationer som Danmarks Idrætsforbund (DIF), Danske Gymnastik og Idrætsforeninger (DGI) og de respektive forbund er indlysende centrale aktører og ambassadører i forhold til at varetage børns helbred og succes. På samtlige af deres hjemmesider henvises også til skadesforebyggende programmer, hvor DGI er særligt proaktive med gode råd om også at håndtere skader, når først de er sket (18).

I 2005 iværksatte Dansk Håndbold Forbund i samarbejde med Gigtforeningen og Dansk Selskab for Sportsfysioterapi en landsdækkende kampagne ("KNOKL FOR DIT KNÆ"), der havde til hensigt at forebygge knæskader blandt unge håndboldspillere. For nylig har Senter for Idrætsskadeforskning i et samarbejde med Olympiatoppen i Norge lanceret en hjemmeside og app (skadefri.no), hvor forebyggende idrætsspecifikke træningsøvelser demonstreres indenfor 50 olympiske idrætsgrene.

Alle er reelle og gode initiativer. Men desværre virker det ikke til, at der hidtil er gjort en tilstrækkelig indsats for at programmerne synliggøres og forankres der, hvor de bør. I en spørgeskemaundersøgelse blandt en repræsentativ kohorte af næsten 700 unge danske håndboldspillere, angiver kun 3%, at de anvender "KNOKL FOR DIT KNÆ" i deres træning (19).

A call to action

På Syddansk Universitet ønsker vi at bidrage til DIFs målsætning om, at idrætsarenaen bliver et sted, hvor der dyrkes fysisk aktivitet samt skabes sociale bånd, der gør os sunde og forebygger sygdom gennem hele livet (20). I samarbejde med nationale og internationale forskere, samt relevante aktører indenfor idrætten, ønsker vi derfor at kortlægge, hvad der skal til for at ændre at alle aktører i idrætsverdenen og i samfundet generelt anerkender de negative konsekvenser, det også kan have at dyrke idræt, og ikke mindst iværksætter tiltag der kan reducere disse.

I den forbindelse er vi meget interesseret i at høre fra jer, der arbejder med unge idrætsudøvere i praksis:

Hvad er jeres gode og negative erfaringer, og hvordan løfter vi i fællesskab denne vigtige opgave?

Ethvert bidrag, kommentar og overvejelse er vigtig.

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Predictors of poor 5-year outcome after acute ACL injury may be modifiable through choice of management strategy

– An exploratory analysis of the KANON trial

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Summary

Purpose:

Identify predictors of five-year outcome after acute ACL-rupture and management with early-reconstruction (plus exercise therapy), exercise therapy alone or delayed-reconstruction (after exercise therapy).

Methods:

Using KANON Trial data, relationships between predictors and five-year KOOS Pain, Symptoms, Sport/Recreation and Quality of Life (QOL) scores were investigated.

Results:

For all participants, second ACL injury, non-ACL surgery and worse baseline mental health-status predicted worse outcomes. Treatment with exercise therapy predicted less knee symptoms compared with early-reconstruction.

Early-reconstruction: baseline meniscus injury predicted worse sport/recreation function, osteochondral lesions predicted worse QOL, and additional (non-ACL) surgery and worse preoperative knee scores predicted worse five-year outcomes.

Exercise-therapy alone: undergoing non-ACL surgery predicted more pain at five years.

Delayed-reconstruction: baseline meniscus injury predicted less pain at five-years and second ACL injury predicted worse five-year outcomes.

Conclusion:

Differences in predictors for five-year outcome between treatment groups may help to guide ACL treatment recommendations based on patient characteristics.

The ongoing debate surrounding ACL management

There is ongoing debate between researchers and clinicians regarding whether non-operative or surgical treatment is most beneficial for ACL injured individuals. Despite the publication of over 25,000 studies of ACL injury, there is a scarcity of high quality research comparing outcomes after management with high-quality rehabilitation, compared to outcomes after ACL reconstruction (1). Despite this, in many countries ACL reconstruction is still performed as the first line treatment especially when patients want to get back to sport after surgery. Yet we know that a substantial proportion of people continue to have pain, symptoms and a poor quality of life more than five years after an ACL reconstruction (2) and only 55% return to competitive sport after ACL reconstruction (3). Alarming, as many as one in three young ACL-reconstructed individuals suffer a second ACL injury following ACL reconstruction (4). This is of great concern, considering revision ACL-reconstruction results in worse outcomes than a primary ACL reconstruction, including increased rates of osteoarthritis, activity restrictions, more pain, symptoms and worse quality of life (5-7). Research suggests that individuals can return to sport following management with rehabilitation alone (8), and multiple systematic reviews have found similar long-term outcomes (including knee function, quality of life, activity levels, osteoarthritis) following management with and without ACL reconstruction (1, 9, 10). The ongoing debate highlights the need for a greater understanding of which patients are best suited to a particular ACL management approach.

The KANON Trial

A recent review identified 418 randomised controlled trials (RCTs) on ACL injury (11). Of these, the KANON Trial was the only RCT to compare outcomes after management of acute ACL injury with exercise-therapy and ACL-reconstruction. This KANON Trial compared outcomes between people randomised to receive either early ACL reconstruction plus exercise therapy, or exercise therapy alone with an option of having delayed ACL reconstruction if desired or required (12). As a result

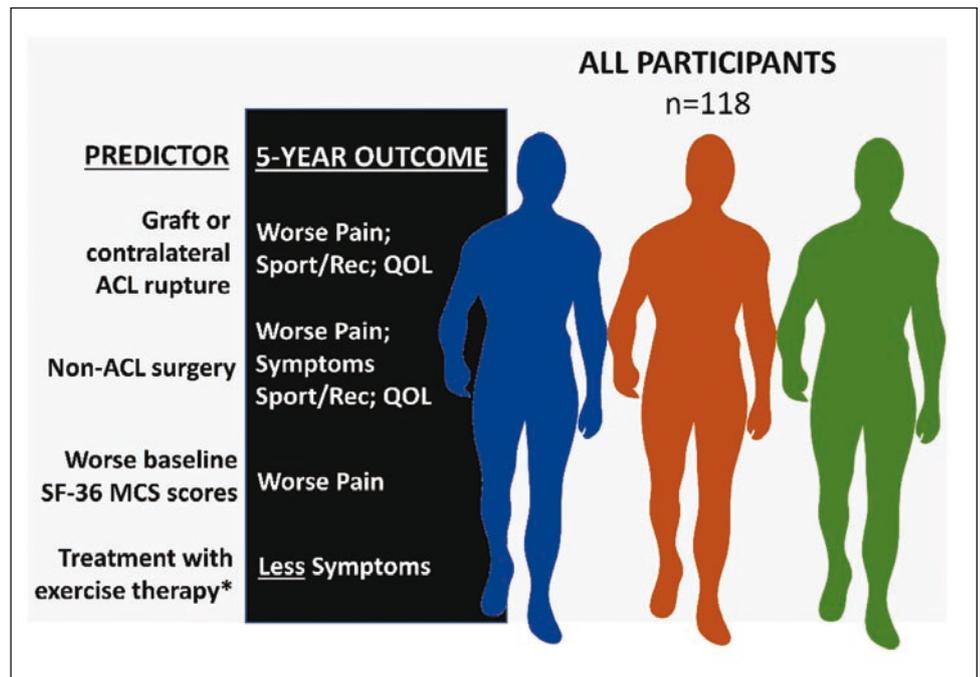


Figure 1. A summary of predictors of five-year patient-reported outcome for all participants in the KANON Trial

Results extracted from: Filbay SR, Roos EM, Frobell RB, Roemer F, Ranstam J, Lohmander LS. (2017) Delaying ACL reconstruction and treating with exercise therapy alone may alter prognostic factors for 5-year outcome: an exploratory analysis of the KANON trial. *British Journal of Sports Medicine*. 51(22) 1622-1629.

* compared to the early ACL reconstruction group

of high methodological quality (9) and standardised, goal-orientated evidence-based rehabilitation, the KANON Trial minimised bias that had limited previous studies. At two and five years following acute ACL injury, the KANON Trial found similar physical activity levels, rates of subsequent meniscus surgery, symptoms, pain, quality of life and radiographic joint changes between treatment groups (12, 13). Notably, there was also no difference in outcomes between patients who had an early ACL reconstruction, patients managed with exercise therapy alone, and those initially managed with exercise therapy who underwent a delayed ACL reconstruction (12, 13).

Who is better suited to exercise therapy or ACL-reconstruction? An exploratory analysis of the KANON Trial

Irrespective of treatment strategy, a proportion of individuals experience persistent knee difficulties and unsatisfactory outcomes following ACL rupture. For this reason, we performed a study using data from the KANON

Trial to identify specific patient characteristics associated with worse five-year outcomes following each of the three ACL-management strategies (14). We hypothesised that differences in predictors of five-year outcome between treatment groups, may guide clinicians in identifying which patients are most suited to a particular management strategy.

What factors were associated with poor five-year outcome after ACL injury?

All participants in the KANON Trial
Irrespective of treatment technique, graft or contralateral ACL rupture, undergoing non-ACL knee surgery and worse baseline mental health-status scores, were associated with worse five-year patient-reported outcomes (pain, symptoms, sport and recreational function, quality of life) (Figure 1) (14). Patients who were treated with exercise therapy alone were less likely to have knee symptoms at five years compared to those who had an early ACL reconstruction.

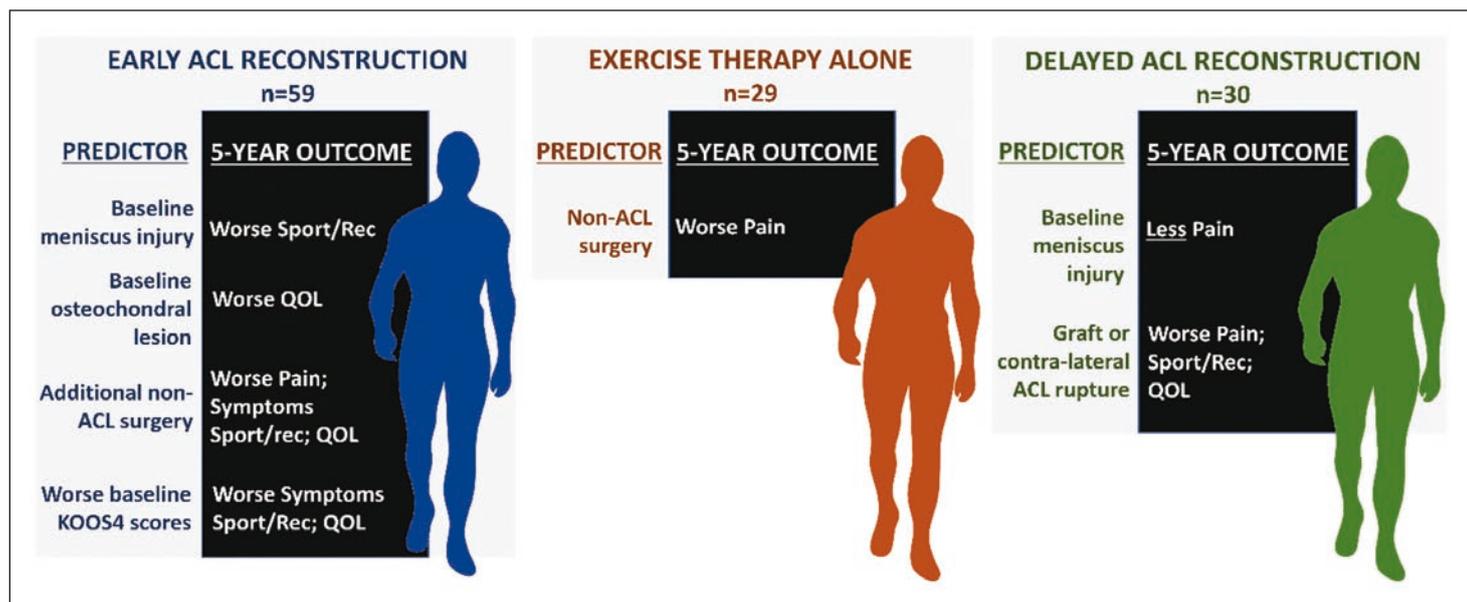


Figure 2. A summary of predictors of five-year patient-reported outcome based on treatment received in the KANON Trial. Results extracted from: Filbay SR, Roos EM, Frobell RB, Roemer F, Ranstam J, Lohmander LS. (2017) Delaying ACL reconstruction and treating with exercise therapy alone may alter prognostic factors for 5-year outcome: an exploratory analysis of the KANON trial. *British Journal of Sports Medicine.* 51(22) 1622-1629.

ACL injury managed with early ACL-reconstruction plus exercise therapy

Predictors of poor five-year outcome following management with early ACL-reconstruction included baseline meniscus injury or osteochondral lesion, undergoing additional (non-ACL) surgery and more self-reported baseline knee impairment (worse KOOS scores) (Figure 2) (14).

ACL injury managed with exercise therapy alone

On the other hand, undergoing non-ACL knee surgery within five years of ACL injury was the only predictor of poor five-year outcome for patients managed with exercise therapy alone (Figure 2) (14).

ACL injury managed with initial exercise therapy plus a delayed ACL-reconstruction

For the individuals who underwent a delayed ACL-reconstruction within five years of injury, a second ACL injury (graft or contralateral ACL rupture) predicted worse five-year outcome. Additionally, baseline meniscus injury predicted less knee pain at five-year follow-up following a delayed ACL-reconstruction (Figure 2) (14).

Interpretation and clinical implications

Some patients may be better suited to management with exercise therapy

The observed differences in predictors of poor five-year outcome, suggest that delaying ACL reconstruction and managing ACL rupture with exercise therapy alone may have positive impacts on five-year outcome for some individuals. Young, active individuals with an acute ACL tear with associated meniscus injury, and those reporting more severe knee pain, symptoms, worse function and worse QOL, may especially benefit from starting treatment with exercise therapy before considering an ACL reconstruction.

Despite being considered as a 'non-invasive' surgical procedure compared with the earlier open-surgical techniques, an ACL reconstruction causes additional damage to knee structures. This can include complete or partial tendon rupture for graft harvesting, bone-drilling induced fractures, and tissue damage through surgical excisions (including fat pad, bursa, superficial nerves, synovium). Surgically induced knee trauma might explain why early-reconstruction was a predic-

tor of more knee symptoms at 5-years compared with management with exercise therapy alone. The impact of this additional tissue damage on long-term outcome is not clear. Several examples can be drawn from sports medicine where sustaining a second injury to an acutely injured tissue amplifies recovery time by more than two-fold (for example, consider two consecutive concussions, or a second quadriceps contusion shortly after the initial injury). It is possible that allowing the initial signs of trauma from ACL injury to subside before considering an ACL reconstruction, could promote healing of knee structures and benefit long-term outcome for some individuals.

Baseline meniscus injury was only a risk factor for worse five-year outcome, when coupled with an early ACL-reconstruction. Patients with meniscus injury had better outcomes if they were managed with exercise therapy before undergoing a delayed ACL reconstruction compared to those without meniscus injury. Following ACL reconstruction, a patient can expect months of knee pain and joint inflammation, an altered gait pattern, functional limitations, reduced muscle activation and strength deficits. It is possible that

these factors have a negative impact on the ability for the meniscus to heal, compared to an exercise therapy program where progression is guided by knee symptoms and pain and inflammation typically subside at a faster rate than postoperatively. Further research is needed to explore these possibilities.

Enable the patient to make an informed decision regarding ACL management

Unbiased evidence surrounding ACL management options should be provided to ACL injured individuals. What we currently know is that on average there is no difference in long-term outcomes between people managed with exercise therapy and those managed with an ACL reconstruction. It is a common misconception that people cannot return to sport if they do not undergo an ACL reconstruction. Rather, a proportion of people do return to sport after management with exercise-therapy alone. We know that rupturing the ACL graft is common after ACL reconstruction, once this happens, an individual is at high risk of experiencing poor long-term outcomes. Additionally, despite common misconception, there is no current evidence to support the argument that ACL reconstruction reduces subsequent meniscus and cartilage injury after an acute ACL tear compared to management with high-quality exercise therapy. However, the literature does highlight that early management of ACL injury is necessary to reduce the risk of additional knee injury, and subsequent osteoarthritis. Prehabilitation improves outcomes after ACL reconstruction and deciding to undergo ACL reconstruction after a period of high-quality rehabilitation does not have negative impacts on outcome. In fact, commencing exercise therapy before considering ACL reconstruction may have positive impacts on long-term outcome for some individuals.

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Meniskskader og mekaniske symptomer – er der en sammenhæng?

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I den Nationale kliniske retningslinje for meniskpatologi i knæet fra 2016 angives mekaniske symptomer som låsning og/eller vedvarende manglende evne til at strække knæet helt (strækkedefekt) som vigtige indikationer for artroskopi (1). Sådanne mekaniske symptomer er hyppige hos patienter med knæproblemer og fører ofte til mistanke om en meniskskade. Det er dog velkendt, at patienter med andre knælidelser som f.eks. artrose, korsbåndsskader og synovitis også oplever sådanne mekaniske symptomer (2-5).

Formodningen om, at meniskkirurgi er effektiv hos patienter med mekaniske symptomer og en meniskskade hviler på antagelsen om, at de mekaniske symptomer er forårsaget af selve meniskskaden. Hvorvidt denne antagelse holder, eller om disse symptomer bør betragtes som et mere generelt symptom hos patienter med knæproblemer, er ikke velundersøgt.

For bedre at forstå samspejlet mellem meniskskader og mekaniske symptomer som låsning og strækkedefekt gennemførte vi for nyligt et studie, hvor vi undersøgte sammenhængen mellem disse (7).

I studiet indgik patienter fra Knee Arthroscopy Cohort Southern Denmark (KACS), som er et samarbejdsprojekt mellem SDU og de ortopædkirurgiske afdelinger på Sygehus Lillebælt (Kolding og Vejle) samt

Odense Universitetshospital (Odense og Svendborg), der følger meniskopererede patienter (6). 817 patienter med mistanke om meniskskade besvarede før knæartroskopi spørgsmål omkring tilstedeværelsen af låsningssymptomer og manglende evne til at strække benet (strækkedefekt). Ved artroskopien viste det sig, at 176 ud af de 817 patienter *ikke* havde en meniskskade, mens de resterende 641 havde en meniskskade.

Begge typer af mekaniske symptomer var hyppige. 55% af patienterne selvrapporterede låsningssymptomer og 47% oplevede problemer med at strække knæet helt. Dog var ingen af de mekaniske symptomer hyppigere hos patienter med meniskskader i forhold til de patienter, der ikke havde en meniskskade – og vi kunne dermed *ikke* påvise en sammenhæng mellem meniskskader og mekaniske symptomer.

Som beskrevet er mekaniske symptomer også velkendte hos andre typer af patienter, som eksempelvis patienter med artrose, synovitis og korsbåndsskader (2-5). Vi fandt dog at bruskskader, synovitis og et defekt korsbånd var sjældnere fund samt mindre alvorlige hos patienterne uden meniskskade end hos patienterne med meniskskade. Således kan forekomsten af sådanne knælidelser næppe forklare årsagen til den høje forekomst af mekaniske symptomer hos patienterne uden meniskskade.

I tillæg fik 26% af patienterne uden meniskskade udelukkende udført en såkaldt diagnostisk artroskopi, hvilket ligeledes indikerer fravær af knæpatologi, der kan forklare de patientrapporterede mekaniske symptomer.

Resultaterne fra dette studie (7) indikerer, at man skal være særdeles varsom med at konkludere, at mekaniske symptomer stammer fra menisken, selv hos patienter med en verificeret meniskskade. I forlængelse af dette fandt vi for nylig ingen vigtig sammenhæng mellem en lang række patologiske tilstande identificeret ved knæartroskopi (bruskskader, synovitis, type af meniskskade, osv.) og præoperative mekaniske symptomer (Pihl et al., in review), hvilket yderligere styrker dette.

Samlet set viser vores resultater, at selvrapporterede mekaniske symptomer ikke er specifikke for patienter med meniskskader, men nærmere bør anses som et generelt og hyppigt symptom hos patienter med knæproblemer. Klinikere bør derfor være påpasselige med at lade tilstedeværelsen af mekaniske symptomer være afgørende for diagnosticering og valg af behandling.

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Jonas Bloch Thorlund



Kenneth Pihl

Cykling til arbejde og i fritiden i forhold til udvikling af type 2 diabetes og hjertesygdom

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Indledning

En stor del af den danske voksne befolkning er ikke tilstrækkeligt fysisk aktive i forhold til optimal sundhedsfremme og sygdomsforebyggelse. Mange har et ønske om at være mere aktive, men bryder sig ikke om at gå til eksempelvis fitness eller anden struktureret motion. Det kan også for nogen være en udfordring i en travl hverdag at finde tid og overskud til træning. Cykling som transport til arbejde eller andetsteds kan for mange mennesker være en måde at få integreret fysisk aktivitet i dagligdagen uden at det nødvendigvis koster ekstra tid. Cykling som alternativ til biltransport har også andre samfundsmæssige gevinster. Færre biler på vejene er forbundet med mindsket udledning af partikler og udstødningsgasser, der kan være til skade for miljøet og for helbredet hos mennesker, der færdes i bynære områder med mange biler. Ligeledes vil færre biler også betyde mindre støj og trafikthæthed, der er et stort problem i de store byer i Danmark og udlandet. I et miljømæssigt perspektiv i relation til CO₂ aftrykket er cykling ligeledes relevant eftersom transportsektoren er

en betydelig kilde til CO₂ udledning; den er ansvarlig for omtrent 1/4 af den totale udledning og forventningerne er, at CO₂ udledning fra transportsektoren vil stige indtil 2030 (1).

Sammenlignet med andre lande er cykling særdeles udbredt i Danmark, hvilket bl.a. kan tilskrives cykelvenlig infrastruktur. Baseret på data fra den regionale sundhedsprofilundersøgelse, der omfatter en stor repræsentativ stikprøve for Region Syddanmark, er cykling den primære transportform til arbejde eller uddannelse for 18 % af voksne mænd og kvinder (2). Til sammenligning er andelen som cykler til arbejde i USA, Australien, Storbritannien og Canada omkring 1-2% (3).

Selv om cykling er relativt udbredt i Danmark sammenlignet med andre lande, så er det bekymrende at cyklens andel af alle ture og cyklens andel af ture til arbejde eller uddannelsessted har været faldende siden starten af 90'erne (4). Det er i den forbindelse værd at bemærke, at forskellen mellem land og by er stigende, og cyklen i højere grad er blevet et byfænomen. I de seneste 3-4 år har vi gennemført en række studier (5-8), der har haft til

formål at undersøge betydningen af cykling til arbejde og i fritiden i forhold til udvikling af type 2 diabetes og hjertesygdom, der er to store folkesygdomme i Danmark og resten af verden.

Formålet med nærværende artikel er at give et overblik over dette arbejde. Vores forskningsarbejde har været bygget op omkring to store longitudinelle befolkningsundersøgelser (kohortestudier) i Danmark og Sverige: den Danske undersøgelse *Kost, Kræft og Helbred* og den Svenske undersøgelse *The Västerbotten Health Survey*. Fælles for kohortestudierne er, at de er gennemført i store populationer med mange cyklister, hvor cykelkulturen er repræsenteret i alle samfundslag. Styrken ved dette er, at vores estimater afspejler, hvorledes et bredt udsnit af en større vestlig befolkningsgruppe cykler til arbejde og i fritiden og hvordan denne adfærd relaterer sig til sundhed og sygdom.

Kost, Kræft og Helbred

Kohorteundersøgelsen startede i 1993, hvor information vedrørende kost, livsstil, sundhed og sygdom blev indsamlet på 57.053 danske mænd og

kvinder i alderen 50-65 år bosiddende i København og omkringliggende byer, samt Århus og omkringliggende byer. Fem år efter baseline blev deltagerne geninviteret til en follow-up undersøgelse, hvor tilsvarende information blev samlet ind. Spørgeskemaet til deltagerne inkluderede spørgsmål omkring cykelvaner, men også en lang række andre risikofaktorer for udvikling af type 2 diabetes og hjertesygdom. Vi sporede deltagerne 20 år frem i Sundhedsdatastyrelsens Dødsårsagsregister, Landspatientregistret og Det Nationale Diabetesregister i forhold til vital status, diagnosticering af iskæmisk hjertesygdom og type 2 diabetes. På baggrund af data fra registre og spørgeskemaer undersøgte vi sammenhængen mellem udvikling af type 2 diabetes og hjertesygdom i forhold til forskellige oplysninger omkring cykelvaner: den totale cykling ved baseline, 5-års ændringer i cykelvaner fra baseline til follow-up, samt den isolerede betydning af cykling til arbejde, som kun blev rapporteret ved follow-up. I forsøg på at udelukke alternative forklaringer på en eventuel sammenhæng mellem cykling og type 2 diabetes og hjertesygdom (konfounding), inddrog vi i de statistiske analyser information om anden fysisk aktivitet (aktivitet udover cykling), kost- og alkoholindtag, rygning, uddannelsesniveau, alder, køn og mere. I tillæg til undersøgelse af risiko for udviklingen af type 2 diabetes og hjertesygdom, undersøgte vi også betydningen af 5-års ændringer i cykelvaner i forhold til ændringer i livvidde og kropsvægt, samt odds for udvikling af abdominal fedme (svær overvægt ifølge livvidde) og odds for udvikling af overvægt og svær overvægt ifølge BMI.

The Västerbotten Health Survey

Denne kohorteundersøgelse begyndte i 1990, hvor alle voksne mænd og kvinder bosiddende i Västerbottens län (geografisk område i den nordlige del af Sverige) på deres 40-, 50- og 60-års fødselsdag blev inviteret til en helbredsundersøgelse. Frem til 2011 er mere end 32,000 mænd og kvinder med 10 års mellemrum blevet undersøgt minimum to gange. Helbredsundersøgelserne inkluderer bl.a. en fastende blodprøve, måling af blodtryk, oral glukose tolerance test og en

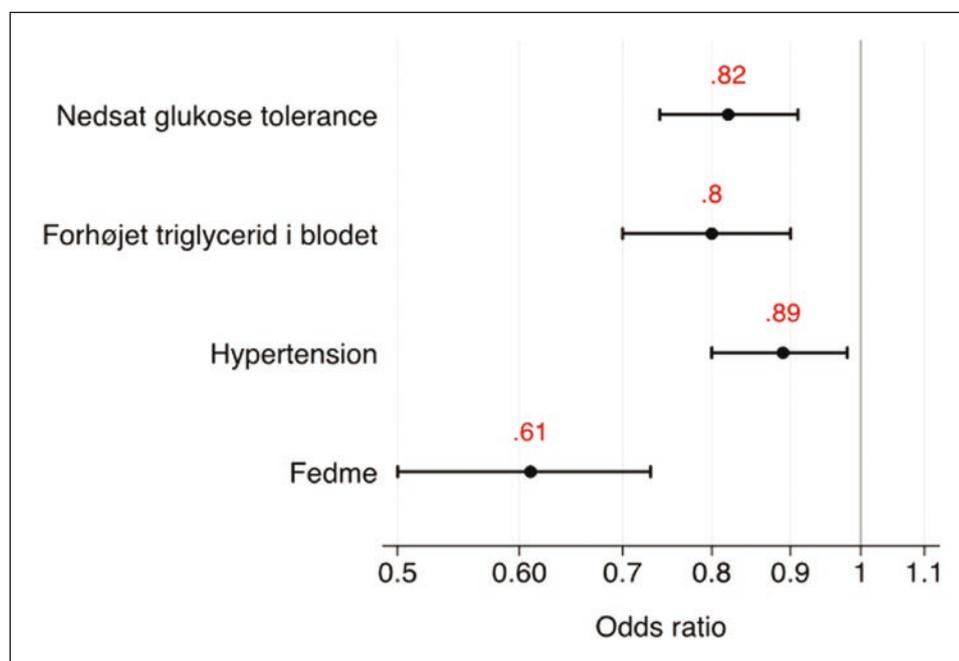
spørgeskemaundersøgelse omkring kost, livsstil, leveform, sundhed og sygdom. Spørgeskemaundersøgelsen inkluderede også information om transportform til arbejde, frekvens af cykling til arbejde hen over forskellige årstider og distance til arbejde ved baseline. Ved hjælp af de biologiske data opgjorde vi 10-års incidens af nedsat glukose tolerance, forhøjet triglycerid, hypertension og svær overvægt ifølge BMI, der er kliniske risikofaktorer for udvikling af type 2 diabetes og hjertesygdom. Blandt deltagere som var i arbejde undersøgte vi sammenhængen mellem cykling til arbejde og 10-års incidens af disse kliniske risikofaktorer med samtidig statistisk kontrol for alder, køn, rygning, alkohol indtag, uddannelsesniveau, kostindtag, og fysisk aktivitet udover cykling.

Udvikling af kliniske risikofaktorer

I den danske kohorteundersøgelse fandt vi, at de mænd og kvinder der cyklede både ved baseline og ved follow-up havde lavere odds for ud-

vikling af svær overvægt ifølge BMI (26% nedsat odds) og lavere odds for udvikling af abdominal fedme (18% nedsat odds), sammenlignet med dem som til begge tidspunkter rapporterede ingen vanlig cykling. Vi fandt også, at de som ved baseline ikke cyklede, men som påbegyndte cykling ved follow-up (såkaldte "startere"), havde en 27% lavere odds for udvikling af abdominal fedme, i forhold til den samme sammenligningsgruppe som ovenfor.

I den svenske kohorteundersøgelse fandt vi at mænd og kvinder, der cyklede til arbejde ved baseline havde lavere risiko for udvikling af svær overvægt ifølge BMI, hypertension, forhøjet triglycerid i blodet og nedsat glukosetolerance sammenlignet med de der benyttede sig af bil, bus eller tog/sporvogn. Vi så indikation på dosis-respons sammenhænge mellem cykling til arbejde og udvikling af risikofaktorerne, hvad angik cykeldistance til arbejde og antallet af sæsoner de cyklede til arbejde. Analyserne af ændring i cykeladfærd til arbejde viste, at oddsene for udvikling af fedme, hypertension,



Figur 1. Odds for 10-års udvikling af kliniske risikofaktorer for hjertesygdom og type 2 diabetes blandt mænd og kvinder der forblev cyklende eller startede med at cykle til arbejde sammenlignet med dem der stoppede med at cykle til arbejde eller forblev med at benytte passive transportformer.

Data er odds ratio med 95 procent konfidens interval fra multivariabel justeret logistisk regression. Der er justeret for alder, køn, opfølgningstid, baseline niveau af de respektive kliniske risikofaktorer, uddannelsesniveau, fysisk aktivitet i fritiden, fysisk aktivitet på arbejde, rygning, alkohol indtag, kaffe indtag, total energi indtag, indtag af frugt og grønt samt indtag af transfedt og fiberindtag.

forhøjet triglycerid i blodet og nedsat glukose tolerance var henholdsvis 39%, 11%, 20% og 19% lavere blandt de, der fortsatte med at cykle eller påbegyndte at cykle til arbejde sammenlignet med de, der stoppede med at cykle eller blev ved med at benytte passive transportformer (Figur 1).

Udvikling af Type 2 diabetes og Hjertesygdom

I Kost, Kræft og Helbredsundersøgelsen fandt vi, at cykling i fritiden eller til arbejde en time om ugen ved baseline var forbundet med en 13% lavere risiko for udvikling af type 2 diabetes, sammenlignet med ingen egentlig cykling, i de 14 år deltagerne blev fulgt. Cykling mere end to en halv time om ugen var forbundet med en større sundhedsgevinst, med en 20% nedsat risiko, sammenlignet med den samme referencegruppe. Vi fandt ydermere at de mænd og kvinder, der påbegyndte cykling fra baseline til follow-up, havde en 20% nedsat risiko for udvikling af type 2 diabetes, sammenlignet med dem som til begge tidspunkter rapporterede ingen vanlig cykling (Figur 2). I forhold til udvikling af iskæmisk hjertesygdom fandt vi, at mænd og kvinder, der cyklede minimum to en halv time om ugen som transport el-

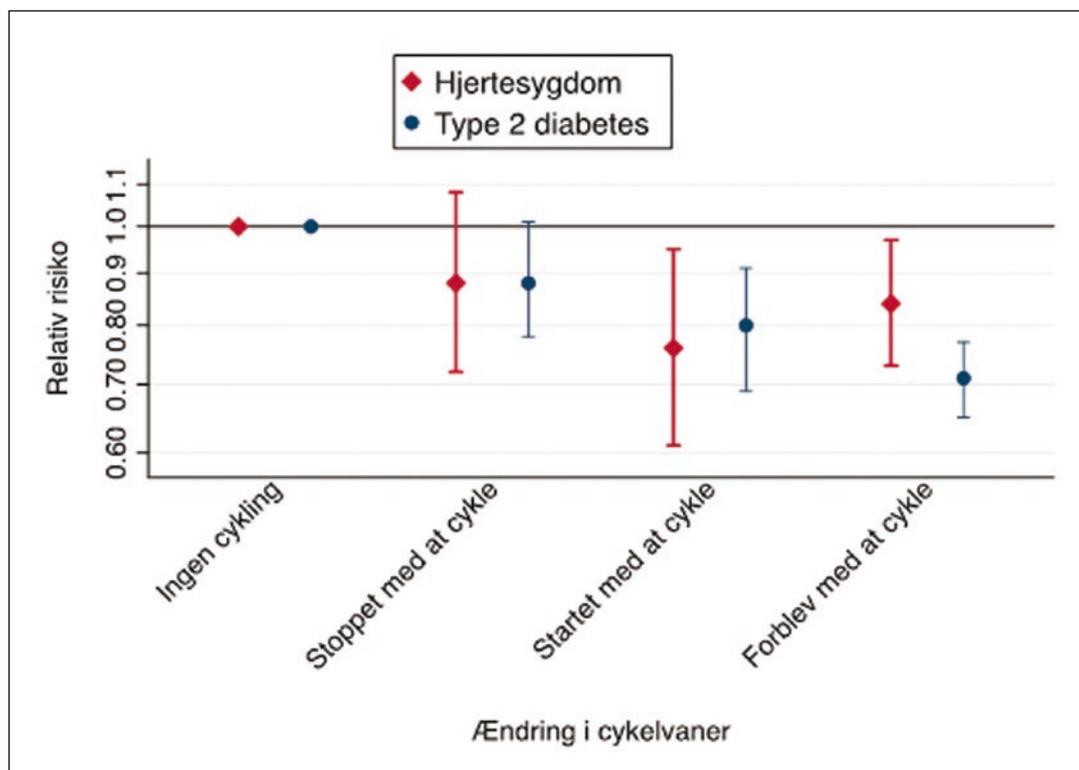
ler i fritiden havde omtrent 20% lavere risiko sammenlignet med dem der ikke cyklede. Ligeledes beregnede vi, at de der startede- eller fortsatte med at cykle i den første 5-års follow-up periode havde en efterfølgende lavere risiko for hjertesygdom på omtrent 20-25% sammenlignet med dem der ikke cyklede ved start eller ved follow-up i undersøgelsen (Figur 2). Ovenstående resultater er især interessante når man tager forsøgsdeltagerens alder i betragtning. Ved baseline var deltagerne mellem 50 og 65 år, dvs. i mange tilfælde meget tæt på pensionsalderen, hvor risiko for udvikling af type 2 diabetes og hjertesygdom er markant større end i den yngre befolkning. Der tegner sig altså et billede af, at også den ældre del af den danske befolkning kan få sundhedsgevinster ved, at starte med at cykle, sammenlignet med at forblive passive.

Perspektivering

Vores nationale forskning resulterede i bred international mediedækning, samt opmærksomhed hos særligt Amerikanske forskere. I det amerikanske tidsskrift Plos Medicine offentliggjorde tidsskriftet en kommentarartikel parallelt med vores artikel om cykling og risiko for udvikling af type 2 diabetes

(9). Forskerne bag kommentarartiklen understregede at andre lande burde se til Danmark og dets cykelvenlige gademiljø, i forhold til at opnå samme mængde cyklisme som i Danmark. En øget mængde cyklisme ville i sidste ende kunne være af stor betydning i forhold til at forebygge livsstilsrelaterede sygdomme i befolkningen (5).

I Danmark er der et stort uudnyttet forebyggelsespotentiale, hvis effektive tiltag til fremme af cykling blev gennemført. Udbredelsespotentialet for cykelpendling er primært tilstede, hvis distancen mellem hjem og arbejde ikke er for stor. Blandt de voksne som har under 10 km til arbejde eller uddannelse, er der ca. 40% der benytter bilen som det transportmiddel i forbindelse med pendling (2). I den danske arbejdsstyrke er der omkring 1,3 mio. personer, der maksimalt har en distance på 10 km mellem hjem og arbejde (10), hvilket betyder at 520.000 personer hver dag tager bilen for at tilbagelægge denne afstand til arbejde. Da omtrent 20 procent af den voksne arbejdende befolkning er stillesiddende i fritiden og ca. 30 procent ikke er tilstrækkeligt aktive i forhold til Sundhedsstyrelsens anbefalinger (2), er det forventeligt at et betragteligt antal nye tilfælde af hjertesygdom og type 2-dia-



Figur 2. Fem-års ændringer i cykelvaner og risiko for udvikling af type 2 diabetes og hjertesygdom hos Danske mænd og kvinder.

Data er angivet som relativ risiko med 95 procent konfidensinterval fra multivariabel Cox regression med justering for alder, køn, fysisk aktivitet i fritiden, fysisk aktivitet i forbindelse med arbejde, kost- og alkohol indtag, rygning, uddannelsesniveau, kaffe indtag, familiehistorie af hjertesygdom eller type 2 diabetes og en række kostrelaterede risikofaktorer for hjertesygdom og type 2 diabetes.

betes kan forebygges, hvis det lykkedes at få blot en mindre andel af inaktive til at skifte bilen ud med cyklen ifm. pendling til arbejde.

Vi tager i Danmark for givet, at vi fx har en cykelsti på de fleste veje i små og store byer, og at denne cykelsti er klart adskilt med en kantsten eller parkerede biler fra den motoriserede transport. I mange andre lande, opfattes cykling ikke som et godt eller sikkert alternativ til motoriseret transport. Vores forskning har derfor bidraget med ny vigtig viden i et globalt perspektiv, omkring betydningen fysisk aktivitet som foregår som en del af hverdagens transport og gøremål. Beslutningstagere i både vestlige og ikke-vestlige lande kan bruge vores og andres forskning som argumentation for, at nationale økonomiske midler til fremme af sundhed og forebyggelse af sygdom i befolkningen kan bruges til forbedringer af forhold for cyklister i eksisterende byer, samt at sikre en fornuftig cykelinfrastruktur når nye veje og bydele bygges.

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GLA:D® er udbredt i hele Danmark og viser gode resultater hos patienter med knæ- og hofteartrose

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Resumé

Godt Liv med Artrose i Danmark (GLA:D®) repræsenterer en evidensbaseret behandlingsindsats, der har vist sig velegnet til implementering i klinisk praksis såvel nationalt som internationalt. På fem år er GLA:D® blevet udbredt i hele landet og er blevet en fast bestanddel af behandlingstilbuddet til patienter med knæ- og hofteartrose i Danmark. Næsten 30.000 patienter har i løbet af 2013-2017 deltaget i et GLA:D®-forløb med gode resultater i form af lavere smerteoplevelse, lavere forbrug af smertestillende medicin, bedre fysisk funktion og bedre livskvalitet.

Hvad er GLA:D®?

Godt Liv med Artrose i Danmark (GLA:D®) er et nationalt initiativ fra Forskningsenheden for Muskuloskeletal Funktion og Fysioterapi ved Syddansk Universitet (1). GLA:D® repræsenterer en evidensbaseret behandlingsindsats for patienter med knæ- og hofteartrose bestående af patientuddannelse og neuromuskulær træning (2) og understøtter implementering af de nationale kliniske retningslinjer på området (3, 4).

Det overordnede formål med GLA:D® er, at alle patienter med artrose uanset bopæl og økonomi skal tilbydes patientuddannelse og træning i henhold til de kliniske retningslinjer og at kirurgi kun skal overvejes, når ikke-operativ behandling ikke giver tilfredsstillende resultater. Se illustration i figur 1.

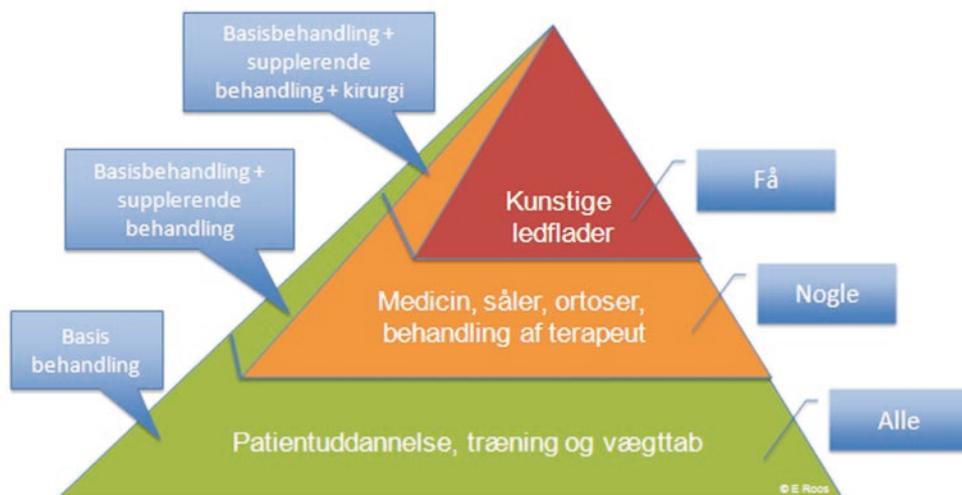
Klinikere uddannes til at varetage GLA:D®-behandlingen på et 2-dages kursus på SDU. Kurset indeholder både teoretisk undervisning, praktiske øvelser samt gode råd omkring opstart og gennemførelse af GLA:D® i klinisk praksis.

Patienterne får adgang til GLA:D® via henvisning fra egen læge/ortopædkirurg eller de har mulighed for selv at henvende sig direkte til GLA:D®-enheden. Efter indledende undersøgelse gennemgår de 2 sessioner med patientuddannelse varetaget af GLA:D®-terapeuten og hvis den aktuelle GLA:D®-enhed tilbyder det, 1 session hvor en tidligere GLA:D®-deltager deler sine erfaringer. Derefter gennemgår patienten et forløb med neuromuskulær træning 2 gange om ugen i minimum 6 uger. Træningen foregår

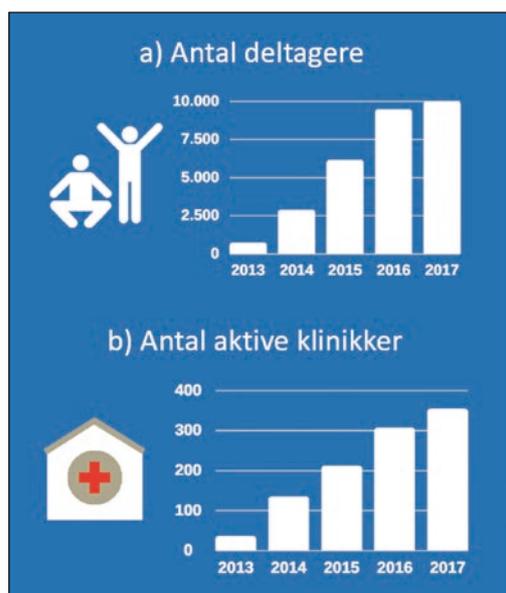
som udgangspunkt som superviseret holdtræning, men patienten har også mulighed for at vælge at gennemføre træningen hjemme efter introduktion til øvelserne. 97 % af patienterne deltager i superviseret holdtræning.

Før og efter GLA:D®-forløbet samt 1 år efter baseline registreres oplysninger om patienten i det nationale GLA:D®-register. Til registret indsamles bl.a. oplysninger om patientens demografiske forhold, smerteoplevelse, medicinforbrug, funktionsniveau, livskvalitet og sygemelding. GLA:D®-registret er med informationer om over 30.000 patienter et af landets største registre for patientrapporterede data og det rummer unikke muligheder for at bidrage til forbedring af behandlingsindsatsen for knæ- og hofteartrosepatienter.

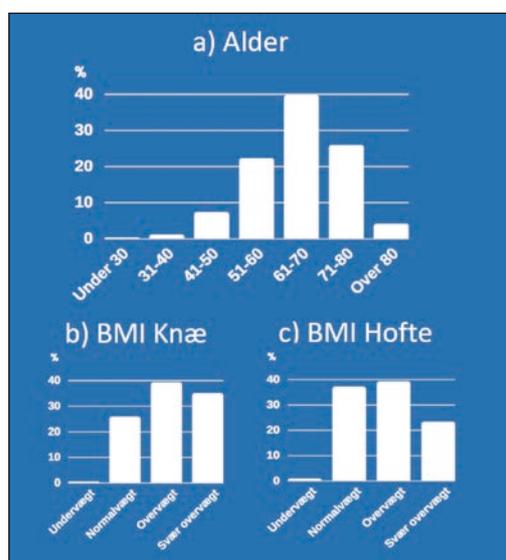
Hvert år udkommer GLA:D® Års-



Figur 1. Behandlingspyramide. De nationale kliniske retningslinjer for behandling af knæ- og hofteartrose beskriver, at alle patienter bør tilbydes basisbehandling i form af patientuddannelse, træning og vægttab ved behov, nogle har behov for supplerende behandling, mens færre har behov for kirurgisk indgreb (5).



Figur 2. Antallet af opstartede GLA:D®-forløb fordelt ift. årstal (a) samt antallet af GLA:D®-klinikker fordelt ift. årstal (b) (n: 29.112 (antal deltagere); n: 383 (antal aktive klinikker)) (6).



Figur 3. Aldersfordeling (a) samt fordeling af BMI for hhv. knæ- og hoftepatienter (b og c) ved opstart i GLA:D®-forløb. Gruppering af BMI: Undervægt: BMI under 18,5; Normalvægt: BMI 18,5 – 24,9; Overvægt: BMI 25 – 29,9; Svær overvægt: BMI 30 eller højere (n:29.077 (alder); n:21.697 (BMI knæ); n:7.335 (BMI hofte)) (6).

rapport, som opsummerer resultater af patientforløbene og gør status over GLA:D®. Denne artikel tager primært udgangspunkt i Årsrapport 2017, som gør status over de seneste 5 års udvikling fra introduktionen af GLA:D® i Danmark.

Udbredelse af GLA:D®

Siden starten i 2013 har SDU afholdt 16 kurser for i alt næsten 1.200 klinikere. GLA:D® er udbredt i hele landet og tilbydes på omkring 400 GLA:D®-enheder - primært i privat praksis, men også i kommunalt regi. Omkring 15 % af forløbene foregår i kommunalt regi og der er ca. 25 aktive kommunale enheder.

Fra 2013 til 2017 har der været næsten 30.000 patientforløb i alt. Det årlige antal GLA:D®-patienter er steget fra 700 deltagere i 2013 til næsten 10.000 deltagere i 2017. Ligeledes er antal GLA:D®-enheder der har haft patientforløb steget fra 35 i 2013 til 353 i 2017. Se figur 2.

Hvem deltager i GLA:D®?

72 % af GLA:D®-patienterne er kvinder og 28 % er mænd. Patienternes gennemsnitsalder ved opstart af forløbet er 64,9 år og alderen spænder mellem 15 og 91 år. Størstedelen af GLA:D®-patienterne har primært besvær med et knæled (75 %) og en stor del af patienterne har besvær med mere end et led (58 %). Forud for GLA:D®-forløbet har knæpatienterne gennemsnitligt haft symptomer fra knæet i 46 måneder og hoftepatienterne har gennemsnitligt haft symptomer fra hoften i 36 måneder. Halvdelen af knæpatienterne og en tredjedel af hoftepatienterne har tidligere haft en skade i knæ eller hofte og mange været igennem kirurgi forud for GLA:D®. Patienternes gennemsnitlige BMI er 28,3. 74 % af knæpatienterne og 62 % af hoftepatienterne er overvægtige eller svært overvægtige. Komorbiditet er almindeligt forekommende. 1 ud af 3 har hypertension og hhv. hjertesygdom, lungesygdom og diabetes rapporteres hos 6-8 % af patienterne. Se fordeling af alder og BMI i figur 3.

Hvad er resultaterne ved afslutning af GLA:D®-forløbet?

Patienterne angiver gennemsnitlig smerteoplevelse fra det aktuelle knæ / den aktuelle hofte inden for seneste

måned på en Visuel Analog Skala (VAS) 0-100 mm (7). Efter GLA:D®-forløbet er den gennemsnitlige smerteintensitet i knæ/hofte faldet med 27 % (fra 47,9 til 35,0 mm) for knæpatienterne og 22 % (fra 47,3 til 36,8 mm) for hoftepatienterne sammenholdt med baseline. Efter GLA:D®-forløbet er andelen, der angiver inden for de sidste 3 måneder at have taget enten paracetamol, NSAID eller et opioid/opioidlignende præparat faldet med 32 % for knæpatienterne (fra 62 til 42 %) og med 24 % for hoftepatienterne (fra 65 til 49 %). Andelen af patienter, der angiver inden for de sidste 3 måneder at have taget et opioid eller opioidlignende præparat, falder fra 7 til 4 % for knæpatienterne og fra 8 til 5 % for hoftepatienterne.

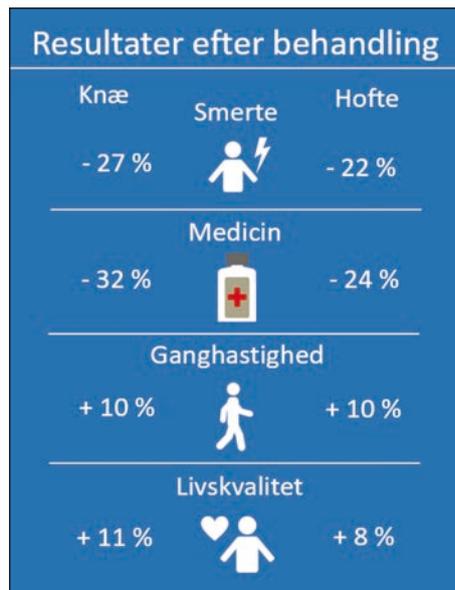
Fysisk funktion vurderes bl.a. ud fra 40 meter gangtest (8, 9). For både knæ- og hoftepatienterne øges ganghastigheden gennemsnitligt med 10 % fra 5,0 km i timen før GLA:D®-forløbet til 5,5 km i timen efter GLA:D®-forløbet. Før GLA:D®-forløbet anvendte 1,8 % af patienterne ganghjælpemiddel ved funktionstesten og tilsvarende 1,1 % efter GLA:D®-forløbet. Vurdering af ledrelateret livskvalitet er baseret på spørgeskemaet KOOS/HOOS QOL og angives på en skala fra 0 til 100, hvor 100 er bedst (10, 11). Efter GLA:D®-forløbet forbedres den gennemsnitlige livskvalitet relateret til knæ/hofte med 11 % (fra 45,6 til 50,6) for knæpatienterne og 8 % (fra 47,6 til 51,6) for hoftepatienterne. Se illustration af resultaterne umiddelbart efter gennemførelse af GLA:D®-forløbet i figur 4.

8 ud af 10 patienter har deltaget i begge teorisessioner og tilsvarende har 8 ud af 10 deltaget i minimum 10 sessioner af gruppetræning. Efter GLA:D®-forløbet angiver 9 ud af 10 patienter, at de synes godt eller meget godt om GLA:D®. Ligeledes angiver 9 ud af 10, at de minimum en gang om ugen anvender det de har lært i GLA:D®-forløbet.

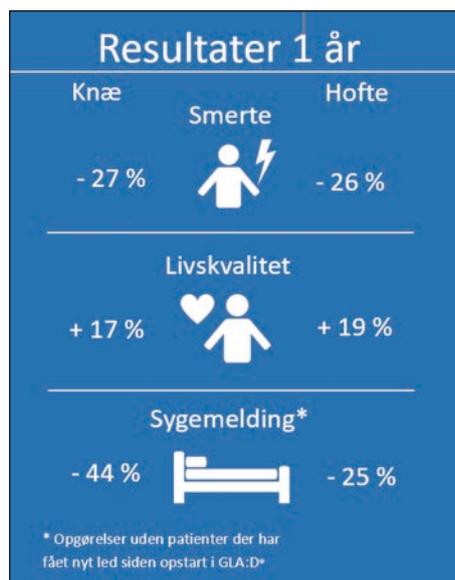
Hvad er resultaterne 1 år efter opstart i GLA:D®?

Resultaterne fastholdes eller forbedres ved 1-års opfølgningen. Knæpatienterne har en gennemsnitlig smertereduktion på 27 % (fra 47,4 til 34,7 mm) og hoftepatienterne har en gennemsnitlig reduktion i smerteintensitet på

26 % (fra 46,5 til 34,5 mm) i forhold til før GLA:D®-forløbet. Et år efter opstart i GLA:D®-forløbet er den gennemsnitlige livskvalitet relateret til leddet yderligere forbedret. For knæpatienterne er livskvaliteten forbedret med 17 % (fra 45,9 til 53,9) og for hoftepatienterne er livskvaliteten forbedret med 19 % (fra 47,6 til 56,5) i forhold til før GLA:D®-forløbet.



Figur 4. Illustration af procentvis ændring i smerte, anvendelse af smertestillende medicin, ganghastighed og ledrelateret livskvalitet fra baseline til opfølgning ved afslutning af GLA:D®-forløb (6).



Figur 5. Illustration af procentvis ændring i smerte, ledrelateret livskvalitet og sygemelding fra baseline til 1 år efter opstart af GLA:D®-forløbet (6).

Blandt knæpatienter, der ikke har fået knæalloplastik i opfølgningsperioden, falder antallet der inden for det seneste år har været sygemeldte på grund af deres led med 44 %. Antallet af sygemeldte falder fra 695 knæpatienter ved baseline til 388 et år efter opstarten af GLA:D®-forløbet. Helt forventeligt er der næsten en fordobling i antallet af sygemeldte for knæpatienter, der har fået knæalloplastik i opfølgningsperioden. Blandt hoftepatienter, der ikke har fået nyt led i opfølgningsperioden, falder antallet der inden for det seneste år har været sygemeldte på grund af deres led med 25 %. Antallet falder fra 101 hoftepatienter ved baseline til 76 et år efter opstarten af GLA:D®-forløbet. For hoftepatienter, der har fået nyt led i opfølgningsperioden, er der en femdobling i antallet af sygemeldte på grund af deres led. Se illustration af resultaterne 1 år efter opstart af GLA:D®-forløbet i figur 5.

Metodiske bemærkninger

Analyserne er foretaget uden sammenligning med kontrolgruppe og det er muligt, at andre faktorer end GLA:D®-forløbet kan have påvirket resultaterne. Forskning tyder dog på, at uden behandling vil symptomer på knæartrose for de fleste forblive på samme niveau (12). Svarprocenten ved hhv. opfølgning umiddelbart efter GLA:D®-forløbet og ved 1-års opfølgningen er 84 og 70 % for patientskemaerne. 8 % af knæpatienterne og 17 % af hoftepatienterne angiver ved 1-års opfølgningen, at de har fået knæ- eller hoftealloplastik siden opstart i GLA:D®-forløbet. Analyser af ændring fra baseline til 1-års opfølgningen er gentaget uden patienter, der har fået alloplastik og kun sygemelding påvirkes markant af dette (se ovenfor). For flere detaljer vedr. metodisk fremgangsmåde henvises til GLA:D® Årsrapport 2017 (6).

GLA:D® internationalt

Internationalt er der stor interesse for GLA:D® og aktuelt er GLA:D® etableret som behandlingstilbud til patienter med knæ- eller hofteartrose i Canada, Australien og Kina. I Canada blev det første kursus for fysioterapeuter afholdt i 2015 og tilsvarende i Australien i 2016. I Kina er fysioterapeuter traditionelt set ikke involveret i behandling af patienter med artrose, så her varetæ-

ges GLA:D®-behandlingen af ortopædkirurger og sygeplejersker. I Kina blev det første kursus for klinikere afholdt i 2017. I alle tre lande er implementeringen af GLA:D® foregået i et tæt samarbejde mellem et lokalt universitet, lokale proaktive klinikere og SDU. Organisationer fra mange andre lande har vist interesse for GLA:D® og det forventes derfor, at GLA:D® vil blive implementeret i flere lande i fremtiden.

GLA:D® – en succesfuld implementering

GLA:D® repræsenterer en evidensbaseret behandlingsindsats, der har vist sig velegnet til implementering i klinisk praksis såvel nationalt som internationalt. På fem år er GLA:D® blevet udbredt i hele landet og er blevet en fast bestanddel af behandlingstilbuddet til patienter med knæ- og hofteartrose i Danmark. Region Syddanmark har pr. 1. februar 2017 indgået en §2-aftale

med Danske Fysioterapeuter vedr. knæartrosepatienter i Region Syddanmark med det formål at sikre et tilbud i praksissektoren, der lever op til anbefalingerne i de nationale kliniske retningslinjer for knæartrose (13, 14).

I løbet af implementeringsperioden har patientgrundlaget i GLA:D® ændret sig i retning af, at patienterne generelt søger GLA:D® langt tidligere i sygdomsforløbet. Fra 2013 til 2017 er den gennemsnitlige symptomvarighed forud for et GLA:D®-forløb faldet fra 73 måneder i 2013 til 39 måneder i 2017 for knæpatienterne og fra 50 måneder i 2013 til 31 måneder i 2017 for hoftepatienterne. En indsats tidligt i sygdomsforløbet i form af patientuddannelse og etablering af træningsrutiner kan have afgørende positiv betydning for den enkelte patient og samfundet.

Gennem implementering af GLA:D® er det således lykkedes at gøre et evidensbaseret behandlingstilbud, der

følger de kliniske retningslinjer, tilgængeligt for patienterne samt generelt at flytte denne behandlingsindsats til et tidligere tidspunkt i sygdomsforløbet. Behandlingstilbuddet har gode resultater på patientniveau og høj patienttilfredshed og implementeringen af GLA:D® vurderes derfor at være succesfuld.

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GLA:D® Ryg: Uddannelse og træning som behandling for rygsmerter

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Rygsmerter er den hyppigste årsag til funktionsnedsættelse

På verdensplan er rygsmerter det helbredsproblem, der giver anledning til flest leveår med nedsat funktion (1). En dansker mister i gennemsnit 7 leveår med god livskvalitet på grund af smerter i muskler og led, og rygsmerter er det den hyppigste årsag til konsultationer i almen praksis (2). Mens de fleste episoder af rygsmerter er forbigående og ikke giver anledning til at søge behandling, er rygsmerter hos nogle en langvarig tilstand med tab af funktionsevne, hvilket fører til tab af livskvalitet og store personlige omkostninger. Samfundsøkonomisk er belastningen fra rygsmerter på højde med andre kroniske lidelser som hjerte-kar-sygdomme, kræft, og psykiatriske sygdomme (3).

Kliniske retningslinjer fra hele verden anbefaler konsekvent, at patienter med langvarige rygsmerter bliver tilbudt patientuddannelse og vejledt træning (4, 5). Fordi rygsmerter hos de fleste er tilbagevendende, bør målet med behandlingen være, at patienterne får redskaber til selv at håndtere deres

rygsproblemer i størst muligt omfang. Alle kliniske retningslinjer fraråder konsekvent rutinemæssig brug af billeddiagnostik, opioidbehandling og invasive behandlinger. Desværre bliver anbefalingerne ikke systematisk implementeret – heller ikke i Danmark – og der er meget lidt evidens, der kan informere, hvordan nye tiltag indføres mest effektivt i klinisk praksis (6).

Knæ- og hoftebehandling viser vejen for ryg

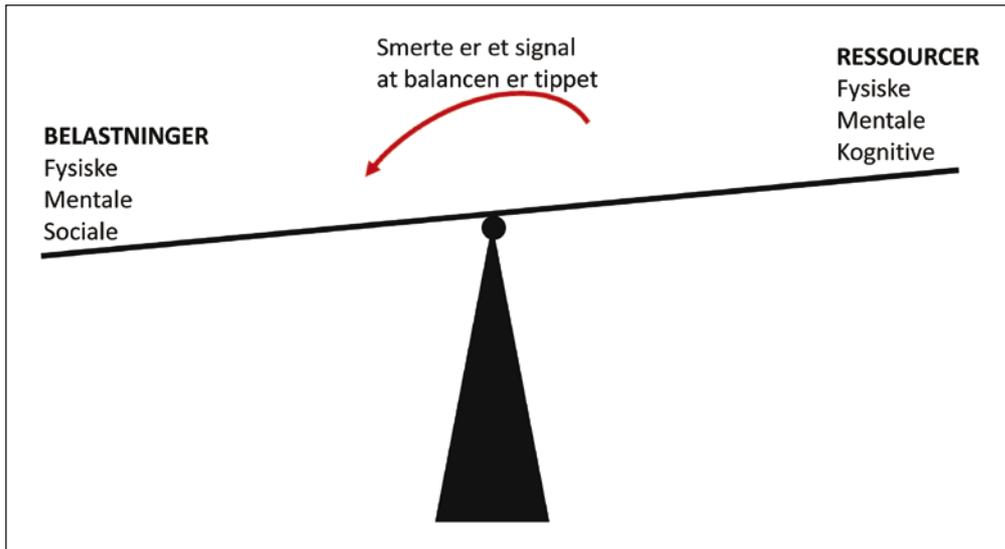
Et usædvanligt succesfuldt eksempel på implementering af kliniske retningslinjer i primærsektoren er GLA:D®-programmet ("Godt Liv med Artrrose i Danmark") for patienter med knæ- og hoftesmerter (7). GLA:D® er et not-for-profit initiativ fra SDU, der har registreret varemærket GLA:D® for at kunne sikre kvaliteten af de behandlingstilbud, der udbydes under navnet. Gennem kurser på SDU er mere end 1.100 klinikere siden 2013 blevet uddannet i at levere en evidens-baseret intervention bestående i patientuddannelse og vejledt træning. Patienter, der gennemgår forløbet, indgår i et klinisk

register, der skal monitorere, hvilke patienter der gennemgår GLA:D-forløb og med hvilket udbytte.

Baseret på de gode erfaringer er GLA:D® fra 2018 blevet udvidet til også at omfatte patienter med rygsmerter - GLA:D® Ryg. Også i GLA:D® Ryg udbyder SDU et 2-dages kursus for fysioterapeuter og kiropraktorer, der gør dem i stand til at levere GLA:D® Ryg og anvende det tilhørende kliniske register. Efterfølgende får de adgang til patientuddannelsesmaterialer og træningsprogrammer, som gør det enkelt at levere interventionen, og som sikrer ensartethed på tværs af udbyderne.

Uddannelse og træning som behandling af rygsmerter

GLA:D® Ryg-interventionen er udviklet til patienter med langvarige eller tilbagevendende rygsmerter. GLA:D® Ryg består af et gruppeforløb med to sessioner patientuddannelse og otte uger med vejledt træning to gange per uge. Patientuddannelse og træning eksisterer i forvejen som behandlingstilbud mange steder, men indhold og omfang er ikke beskrevet, og GLA:D®

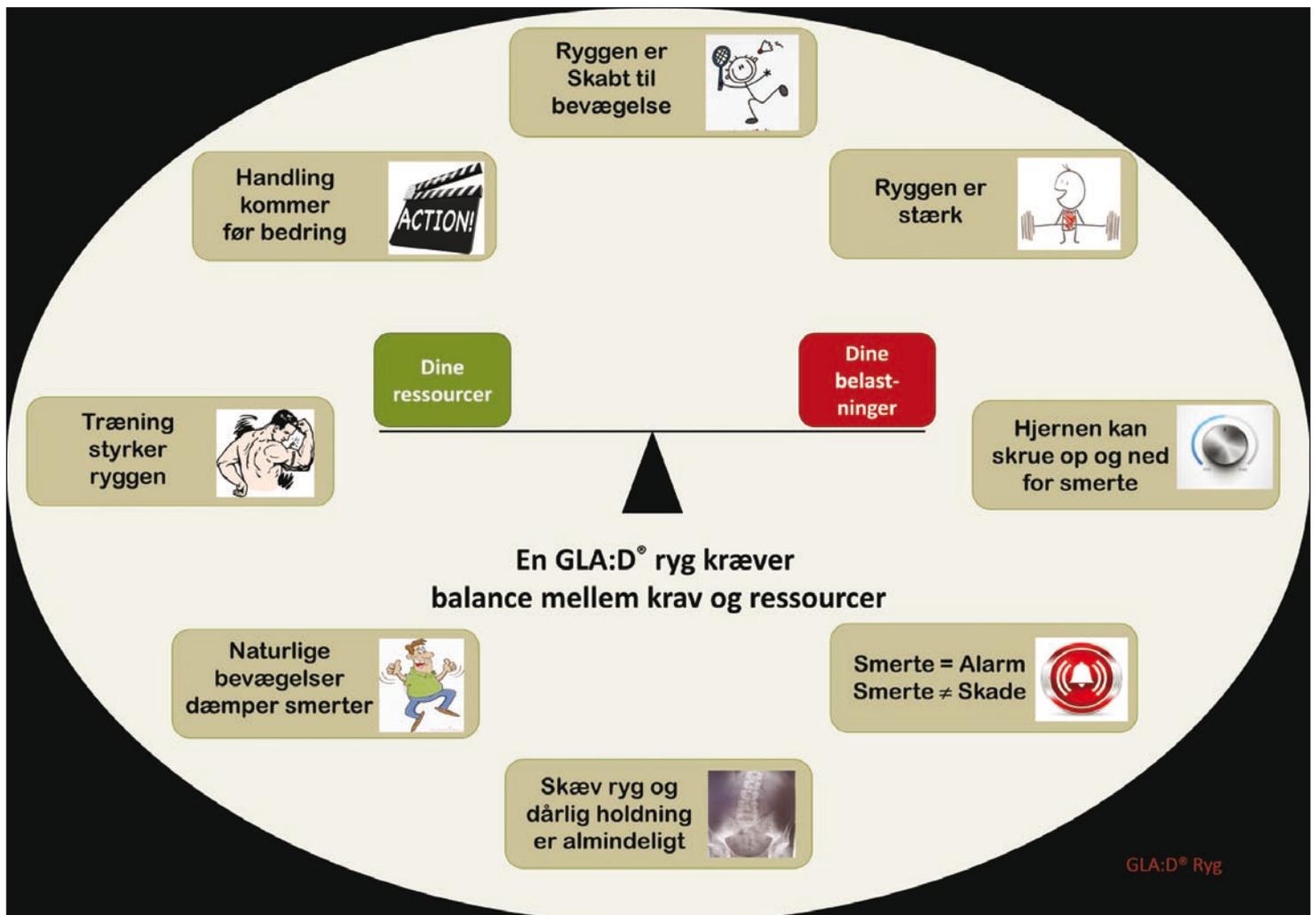


Figur 1. Patientuddannelsen i GLA:D® Ryg lærer deltagerne, at smerte er et udtryk for, at de samlede belastninger overstiger de tilgængelige ressourcer.

Ryg anviser en måde at sætte dette i en velbeskrevet ramme. Derigennem hjælpes klinikere til på en nem måde at anvende bedste evidens og sikre systematisk monitorering af patientforløb.

I patientuddannelsen lærer deltagerne, at smerte ikke alene afspejler, hvad der foregår i ryggens strukturer, men er udtryk for manglende balance mellem de samlede ressourcer man har

til rådighed, og de belastninger man udsættes for. Ressourcer kan øges gennem såvel forbedret fysisk kapacitet som større viden og mentalt overskud. Patientuddannelsen pointerer, at både



Figur 2. Centrale budskaber fra GLA:D® Ryg illustreret i klinikmaterialet.

fysiske, mentale og sociale belastninger kan påvirke rygsmerter (Figur 1). Nøglebudskaber fra patientuddannelsen er blandt andre, at smerte ikke er lig med vævsskade, at ryggen har godt af bevægelse, at ryggens strukturer er stærke, og at det er muligt at øge sin kapacitet gennem træning (Figur 2)

Træningsforløbet har til formål at genetablere naturlig variation i ryggens bevægelsesmønstre, at forbedre ryggens styrke og fleksibilitet og at skabe tillid til at ryggen er stærk og modstandsdygtig. Mennesker med rygsmerter har ofte ændrede og anspændte bevægelsesmønstre, der i sig selv kan vedligeholde smerter. De påvirkede bevægelsesmønstre optræder på et spektrum fra ændret rekruttering lokalt i musklerne til hele bevægelser, der helt undgås (8). Et fællestræk er reduceret variation i bevægelse og dermed mere ensidigt brug af ryggen. Samtidigt er utryghed ved bevægelse og manglende oplevelse af kontrol blandt de bedst dokumenterede faktorer af betydning for, om rygsmerter resulterer i funktionstab (9). Et vigtigt udbytte af vejledt træning er derfor også at få tillid til, at ryggen kan og ikke mindst må bruges.

Der er påvist positive effekter af en række træningsformer for rygsmerter herunder styrketræning, træning af motorisk kontrol, yoga og konditionstræning, hvoraf ingen har påviseligt større effekter end de øvrige (4). Træningsprogrammet i GLA:D® Ryg består derfor af øvelser der træner styrke, udholdenhed, koordination og bevægelighed, som tilsammen bruges til at skabe større variationsmuligheder. Hver øvelse findes på fire niveauer, så deltagerne kan starte på forskelligt niveau og progrediere deres træning individuelt i forløbet. Den samme øvelse og dosis vil formentlig fungere som styrketræning hos nogle patienter og som koordinationsøvelse hos andre afhængigt af den enkeltes udgangspunkt.

Vejledt træning, der traditionelt har fokuseret meget på holdningskorrektion og på én korrekt måde at udføre en øvelse på, fremmer desværre ikke nødvendigvis naturlig og tillidsfuld bevægelse (10). Fokus på korrektion kan blive en hindring for at skabe variation i bevægelse og tiltro til egen håndtering og oplevelsen af, at ryggen kræver høj grad af beskyttelse kan

utilsigtet blive underbygget. Desuden kan man som kliniker være tilbøjelig til at justere øvelser, så patienter undgår smerteprovokation under træning. Det harmonerer dårligt med et ønske om at lære patienter, at smerte ikke er et udtryk for vævsskade. GLA:D® Ryg har derfor fokus på at integrere patientuddannelse og træning. Deltagerne bliver guidet i at afsøge flere måder at udføre øvelserne på, og smerteprovokation er tilladt i det omfang patienten finder acceptabelt. Ved uacceptabel eller tiltagende smerteforværring reduceres træningsniveau eller dosis ved næste træning, og klinikerne drøfter med patienten hvilke andre belastninger, der kan være medvirkende til forværringen.

Forskningsprogrammet GLA:D® Ryg

Forskningsprogrammet for GLA:D® Ryg omfatter tre områder: Den nationale udrulning, uddannelsen af klinikere og effekter på patienter.

Procesevalueringen i relation til udrulning af GLA:D® undersøger hvordan klinikere nås, hvilke klinikere der er motiverede for GLA:D® Ryg, og hvad der skal til for at kiropraktorer og fysioterapeuter begynder at udbyde GLA:D® Ryg i deres klinikker. Vi undersøger blandt andet, om der er forskelle i modtagelsen af GLA:D® Ryg mellem regioner, og forskel på hvilke patienter der gennemgår tilbuddet afhængigt af region eller klinik. Desuden undersøger vi om implementeringen påvirker antallet af henvisninger til skanninger og hospitalssektor for rygsmerter på regionalt niveau.

I forbindelse med afholdelse af kurser, er der opstillet en række læringsmål for de deltagende klinikere baseret på 'The Behavior Change Wheel' (11). Målene omhandler klinikernes motivation, muligheder og kompetencer i relation til at anvende GLA:D® Ryg. Ved at se på, hvordan GLA:D® Ryg udbydes og ved hjælp af 'Determinants of Implementation Behaviors Questionnaire', evaluerer vi, om målene nås. Desuden undersøges, om klinikernes holdninger til rygbehandling (Pain Attitudes and Beliefs Scale) og deres selvtillid i forhold til at arbejde med patienter med rygsmerter (Practitioner Confidence Scale) påvirkes. Gennem observationer på udvalgte klinikker ser

vi på, om interventionen leveres som tilsigtet, og hvilke udfordringer der er med dette.

Patienter, der deltager i GLA:D® Ryg, bidrager med data i form af resultater fra fysiske tests som klinikerne udfører ved start og slut af forløbet, og via patientrapporterede spørgeskemaer ved start og efter 3, 6 og 12 måneder. Data skal anvendes til at monitorere patienternes udbytte af forløbet, til at undersøge om der er grupper af patienter, der har bedre eller dårligere udbytte af programmet, samt til at få forståelse for effektmekanismer ved denne form for behandling. Effektmekanismer undersøges ved at teste hypoteser om, hvad patienter opnår i forløbet i form af viden og fysiske forbedringer, og hvordan dette kan lede til øget egenhåndtering, bedre funktion, færre smerter og i sidste ende mindre behov for behandling og for sygemelding fra arbejde. Effekter på den enkeltes forbrug af sundhedsydelser undersøges ved hjælp af registerdata, der kan belyse, om der sker et skifte i forbrug fra før til efter GLA:D® Rygforløbet.

Denne type implementeringsforskning er det led i forskningskæden fra basalforskning til klinisk praksis, hvor det belyses, om der i en klinisk virkelighed med variation i både patientprofiler og levering af behandling kan opnås samme effekter som i randomiserede studier.

Foreløbige erfaringer

GLA:D® Ryg blev i 2017 først testet i en gruppe patienter på SDUs forskningsklinik. Derefter spurgte vi fem fysioterapi- og fire kiropraktorklinikker, om de ville afprøve kurset og interventionen med henblik på at give feedback via spørgeskemaer, fokusgruppeinterview og et opsamlingsmøde.

Pilotafprøvningen viste, at patienter fandt programmet meningsfyldt, og at det kunne anvendes i klinisk praksis. Patientinterviews gav indtryk af at forløbet hjalp deltagerne til større forståelse for deres rygproblem og til bedre funktion i hverdagen. Gruppen på i alt 92 patienter, der indgik i pilotafprøvning på testklinikkerne havde langvarige rygproblemener (52% rapporterede mere end et års varighed), var typisk i et igangværende behandlingsforløb (70% i mere end fire

uger), havde fortsat moderate smerter (gennemsnit 5 på 0-10 Numeric Rating Scale), og oplevede tilstanden som moderat truende (43 points på 0-80 Illness Perceptions Scale). De opnåede systematiske forbedringer på disse og andre effektmål, herunder på udholdenhed af ryg- og mavemusklere. Resultaterne var på højde med eller bedre, end det der blev observeret for patienter med langvarige rygproblemer, der modtog sædvanlig behandling på de samme klinikker.

Feedback fra testklinikker gav anledning til mindre justeringer af programmet, for eksempel at spændet fra det laveste til det højeste træningsniveau blev større. Desuden var en gennemgående tilbagemelding, at patientuddannelsen var det der gjorde den væsentligste forskel sammenlignet med klinikernes eksisterende tilbud, og at integration af uddannelse og træning opleves vigtig.

Det første åbne kursus blev afholdt for fysioterapeuter og kiropraktorer i marts 2018. Kurserne udbydes for én region ad gangen, og der har foreløbigt været 120 klinikere fra 67 klinikker i Region Syddanmark på kursus, og ca. 50 klinikker i Region Hovedstaden har haft 100 klinikere på kursus (gladryg.sdu.dk). De øvrige regioner følger i efteråret 2018. De første 100 patienter (juni 2018) indgår allerede i registret, der vil skabe basis for en lang række fremtidige forskningsprojekter.

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INTERNATIONALT

12. - 15. september 2018, Brasilien

35th FIMS World Congress of Sports Medicine, Rio De Janeiro.

Info: www.efsm2017.org

25. - 27. september 2018, Marokko

IOC Advanced Team Physician Course, Marrakech.

Info: www.ioc-preventionconference.org

2. - 6. oktober 2018, Tyrkiet

The 14th Turkish Sports Traumatology, Arthroscopy and Knee Surgery Congress, Belek-Antalya.

Info: www.tusyad2018.org/en.htm

4. - 5. oktober 2018, England

British Association of Sport & Exercise Medicine and Faculty of Sport and Exercise Medicine Annual Conference, Leeds.

Info: www.fsem.ac.uk

10. - 13. oktober 2018, Australien

2018 Sports Medicine Australia Conference, Perth.

Info: www.sma.org.au

3. - 4. november 2018, Irland

6th World Congress of Sports & Exercise Medicine, Dublin.

Info: www.wcsem.org

3. - 6. juli 2019, Tjekkiet

European College of Sports Science 24rd Annual Congress, Prag.

Info: www.ecss-congress.eu/2019

12. - 14. marts 2020, Monaco

IOC World Conference on Prevention of Injury & Illness in Sports.

Info: www.ioc-preventionconference.org

4. - 7. juli 2020, Spanien

European College of Sports Science 25rd Annual Congress, Sevilla.

7. - 10. juli 2021, Skotland

European College of Sports Science 26rd Annual Congress, Glasgow.

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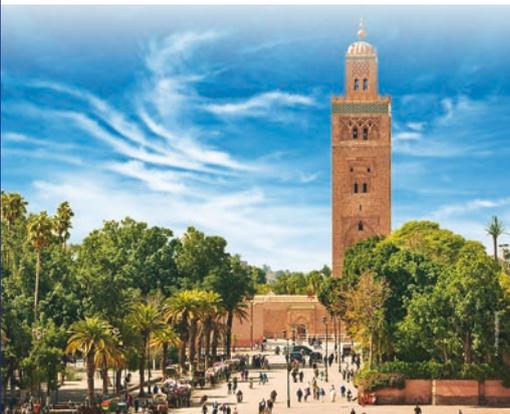


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Målgruppe: Fortrinsvis praktiserende og yngre læger, der har interesse for idrætsmedicin og som ønsker basal indføring i emnet.

DIMS TRIN 2 KURSUS:

Formål og indhold: Kursisten skal indføres i nyeste viden indenfor idræt og medicinske problemstillinger, fx hjerte/karsygdomme, fedme, endokrinologi, lungesygdomme, osteoporose, arthritis og arthrose. Derudover vil der være en gennemgang af træning og børn/ældre. Ydermere vil kursisten præsenteres for idrætsfysiologiske test/screeningsmetoder. Der vil være patientdemonstrationer samt under-

visning i mere avanceret idrætstraumatologi. Varighed er 40 timer over 5 dage.

Målgruppe: Læger med interesse i idrætsmedicin, der ønsker at dygtiggøre sig yderligere udover trin 1-kurset, samt læger der til daglig har at gøre med idrætsmedicinske problemstillinger. Derudover selvfølgelig læger, der ønsker at tage eksamen som diplomlæge i idrætsmedicin.

EKSAMEN:

Hvert 2. år afholdes eksamen. For at kunne deltage i eksamen kræves, at man har deltaget både på DIMS trin 1 og trin 2. Derudover kræves 5 dages fokuseret ophold på idrætsmedicinsk klinik samt udfyldelse af logbog. Eksamen vil bestå af en skriftlig multiple choice del, en praktisk del med figurant/patient, hvor man skal demonstrere at man kan indhente relevant anamnese, undersøge samt lægge plan for videre udredning og genoptræning.

Krav til vedligeholdelse af Diplomklassifikation (CME)

1. Medlemskab af DIMS. Medlemskab af DIMS forudsætter at lægen følger de etiske regler for selskabet.
2. Indhentning af minimum 50 CME-point per 5 år.
3. Dokumentation for aktiviteterne skal vedlægges:
 - For kurser og kongresser vedlægges deltagerbevis og indholdsbeskrivelse (kursusplan).
 - Kursusledelse eller undervisning dokumenteres af aktivitetsudbyderen.
 - Anden idrætsmedicinsk relevant aktivitet dokumenteres af den ansvarlige for aktiviteten.
 - Klublæge/teamlæge erfaring eller lignende dokumenteres af klubben/teamet eller lignende.



Opdateret december 2013.
Opdaterede Krav til opnåelse af Diplomklassifikation kan findes på www.sportsmedicin.dk

AKTIVITET**CERTIFICERINGSPOINT**

AKTIVITET	CERTIFICERINGSPOINT
Deltagelse i Idrætsmedicinsk Årskongres	10 point per kongres
Publicerede videnskabelige artikler inden for idrætsmedicin	10 point per artikel
Arrangør af eller undervisning på idrætsmedicinske kurser eller kongresser	10 point per aktivitet
Deltagelse i internationale idrætsmedicinske kongresser	10 point per kongres
Deltagelse i godkendte idrætsmedicinske kurser eller symposier	5 - 30 point per aktivitet
Anden idrætsmedicinsk relevant aktivitet	5 point per aktivitet
Praktisk erfaring som klublæge, forbundslæge, Team Danmark-læge eller tilknytning til idrætssklinik (minimum 1 time per uge og gyldig dokumentation fra klub/forbund/klinik)	10 point i alt

Idrætsmedicinske arrangementer pointangives af Dansk Idrætsmedicinsk Selskabs Uddannelsesudvalg for kursusafholdelse.

NAVN: _____ KANDIDAT FRA ÅR: _____ DIPLOMANERKENDELSE ÅR: _____

Sendes med bilag til DIMS diplomudvalg v/ Jan Rømer, Karensmindevej 11, 8260 Viby J, eller pr. e-mail til jromer@dadlnet.dk

om DSSF kurser

Find aktuelle kursusoplysninger og kursuskalender på: www.sportsfysioterapi.dk**Info:**

Kursusadministrator Bente Andersen
Tlf. 2068 8316
Mail: bnan@sportsfysioterapi.dk

Kurstilmelding foregår bedst og lettest via DSSF's hjemmeside: www.sportsfysioterapi.dk



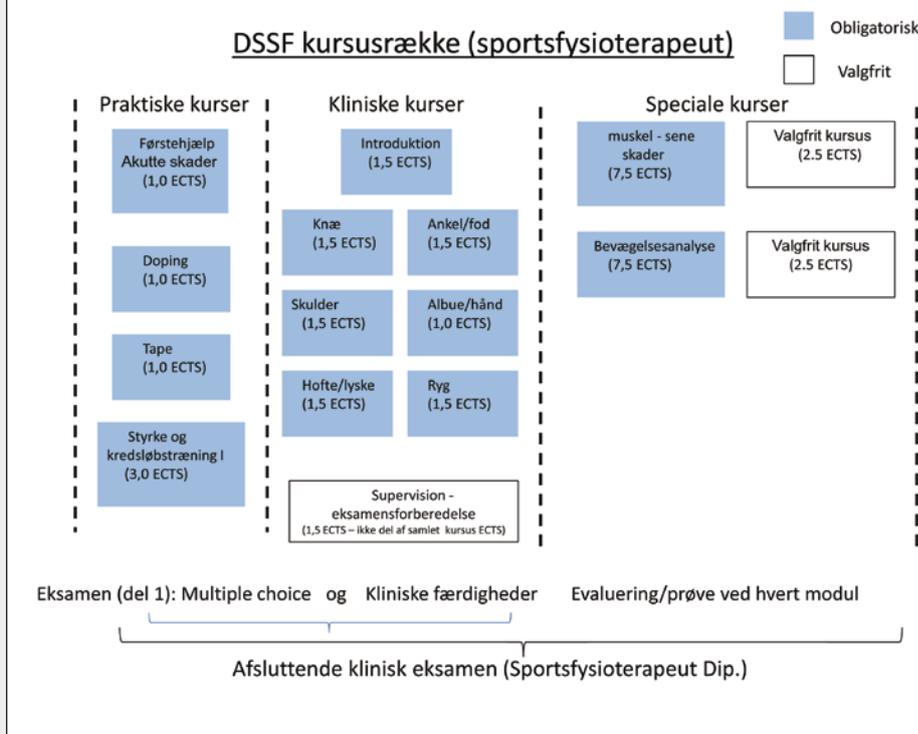
DANSK SELSKAB FOR SPORTSFYSIOTERAPI

Uddannelses- og kursusstruktur**Fremtidssikring**

Dansk Selskab for Sportsfysioterapi (DSSF) har ændret uddannelses- og kursusstrukturen med det formål at fremtidssikre den såvel nationalt som internationalt. Ved de ændringer, der er planlagt, kan DSSF sikre at medlemmerne kan dokumentere den kontinuerlige kompetenceudvikling, der skal være til stede for at kunne kvalificere sig til at gå til specialisteksamen, som beskrevet af Danske Fysioterapeuter/Dansk Selskab for Fysioterapi og dermed bære titlen: Specialist i Idrætsfysioterapi. Derudover hjælpes medlemmerne til at få et redskab til brug ved karriereudvikling, f.eks. karriereplanlægning, lønforhandling og anden form for markedsføring af kompetencer.

Mål

Vores mål med den samlede uddannelses- og kursusaktivitet er at ligge væsentligt over grunduddannelsesniveaue ved at skabe klinisk kompetence hos vores medlemmer på et højt niveau i forhold til de sportsfysioterapeutiske kerneområder og med evidensbaseret baggrund, hvor der tages afsæt i videnskabelig viden kombineret med omfattende kliniske færdigheder og praktisk erfaring.

Tabel 1: Skematisk oversigt over uddannelses- og kursusstrukturen**Samlet uddannelsesforløb**

Vi har tilstræbt at skabe et samlet uddannelsesforløb med deleksamener undervejs, så man kan vælge at tage kurserne enten enkeltstående eller som dele af et samlet forløb.

Uddannelsen er opdelt som beskrevet i **tabel 1 og 2**: Praktiske kurser, Kliniske kurser og Speciale kurser. Det samlede uddannelsesforløb inkl. eksaminerne er beregnet til 45 ECTS.

Praktiske og kliniske kurser

De praktiske kurser indeholder: Akutte skader og førstehjælp, Antidoping og kost, Styrke- og kredsløbskursus, Tapekursus.

De kliniske kurser består af Introduktionskursus, Rygkursus, Hoftekursus, Knækursus, Fod/ankelkursus, Skulderkursus, Albue/håndkursus.

Har man gennemgået kurser før 2002, kræves det at man tager introduktionskursus for at kunne deltage på de kliniske kurser/regionkurserne. Har man gennemgået kurser mellem

2002 og 2015 godkendes disse i den nye struktur fra 2015.

For at gå til eksamen skal man dog supplere med de kurser, man mangler i forhold til den nye struktur (2015). Fx. Akutte skader/Førstehjælp, Antidoping/Kost, Styrke/Kredsløb, Tape og Ryg.

Fysioterapeutstuderende kan deltage i uddannelsesforløbet efter bestået Modul 12.

Specialekurser

DSSF har indledt et samarbejde med SDU om specialekurser. Dette foregår via valgmoduler på Kandidatuddannelsen i Fysioterapi, og modulerne: "Muskel-/seneskader - i relation til sportsskader", og "Analyse af bevægelse og muskelfunktion - i relation til sportsskader" er i gang og man kan søge via SDU 'tom plads-ordning'. DSSF vil bestræbe sig på at udvikle flere moduler af denne art.

De valgfrie kurser i den specialiserede del kan f.eks. være kurser fra andre

DSSF Kursusrække – Sportsfysioterapi ECTS

Tablet 2: Oversigt over ECTS point for uddannelses- og kursusrække for Sportsfysioterapeuter i DSSF.

<u>Praktiske kurser</u>	<u>Kliniske kurser</u>	<u>Speciale kurser</u>	<u>Samlet (ECTS)</u>
Akut førstehjælp (1 ECTS)	Introduktion (1.5 ECTS)	Muskel-seneskader (7.5 ECTS)	
Doping (1 ECTS)	Knæ (1.5 ECTS)	Analyse af bevægelse og muskelfunktion (7.5 ECTS)	
Tape (1 ECTS)	Ankel/Fod (1.5 ECTS)	Valgfrit kursus (2.5 ECTS)	
Styrke- og kredsløbstræning (3 ECTS)	Skulder (1.5 ECTS)	Valgfrit kursus (2.5 ECTS)	
	Hofte/lyske (1.5 ECTS)		
	Ryg (1.5 ECTS)		
	Albue/hånd (1 ECTS)		
<u>Eksamen</u> Multiple choice (1.5 ECTS)	<u>Eksamen</u> Kliniske færdigheder (2.5 ECTS)	<u>Eksamen</u> Inkluderet i individuelle speciale kurser	
I alt: 7.5 ECTS	I alt: 12.5 ECTS	I alt: 20 ECTS	I alt: 40 ECTS
Afsluttende klinisk eksamen i sportsfysioterapi: Sportsfysioterapeut, DSSF regi (5 ECTS)			I alt: 45 ECTS

selskaber og universiteter nationalt og internationalt, for hvilke medlemmerne kan søge merit hos DSSF.

Eksamen

Den planlagte, afsluttende kliniske idrætsfysioterapi-eksamen skal bestå, for at man kan kalde sig Sportsfysioterapi i DSSF regi.

DSSF's samlede uddannelsesforløb vurderes til 45 ECTS. Dette er fremtidssikret i forhold til den endnu ikke godkendte specialistordning i Danske Fysioterapeuters regi.

Supervision

Uddannelsesudvalget (UKU) er i gang med at beskrive supervisionsforløb, som kan matche det angivne krav til supervision for at blive specialist i idrætsfysioterapi (i regi af Dansk selskab for Fysioterapi/Danske Fysioterapeuter). Det ser ud til at kravet vil blive 100 timers supervision, og en stor del af dette vil være en del af de praktiske og kliniske kurser. Derudover planlægges specielle supervisionskurser og endelig skal den enkelte sørge for de sidste supervisionstimer selv. De nærmere

beskrivelser vil foreligge, når den nye specialistordning er endeligt godkendt.

Løbende info på [www](http://www.dssf.dk)

Uddannelsen og kurserne vil løbende blive uddybende beskrevet på DSSF's hjemmeside, og kvalificeret med ECTS. ECTS på tabel 1 og 2 skal således tages med forbehold for ændringer.

Du vil løbende kunne finde opdatering og informationer på www.sportsfysioterapi.dk

Vibeke Bechtold/Bente Andersen


Adresse:

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Gorm Helleberg Rasmussen
Terp Skovvej 82
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www.dansksportsmedicin.dk

Redaktionsmedlemmer for DIMS:

Læge Rasmus Sørensen
rasmussoerensen@msn.com

Redaktionsmedlemmer for DSSF:

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hklakk@health.sdu.dk

Fysioterapeut Merete N. Madsen
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Fysioterapeut, cand.scient.san, PhD
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Jeppe Lykke Ekman

Suppleant Susanne Damgaard

Suppleant Mads Hyldgaard

www.dansksportsmedicin.dk

Find fakta og gamle guldkorn

På hjemmesiden kan du finde de forskellige faktuelle oplysninger af interesse i forbindelse med Dansk Sportsmedicin.

Du kan finde det nyeste blad. Du kan bladere og printe. Du kan også finde eller genfinde guldkorn i artiklerne i de gamle blade. Alle blade kan læses og downloades fra "bladarkiv".

Du kan også søge i alle bladenes indholdsfortegnelser for at få hurtig adgang til det, du er interesseret i at finde.

Adresser. Referencelister. Oplysninger, aktuelle som historiske. Det er alt sammen noget, du kan "hitte" på hjemmesiden, og savner du noget, må du gerne sige til.



IDRÆTSKLINIKKER

Se DIMS hjemmeside: www.sportsmedicin.dk

Bladarkiv

Her ses en oversigt over alle udgivne numre af Dansk Sportsmedicin. Klik på forsiderne nedenfor for at se detaljer om indholdet af et nummer.
Er der et bog-ikon over forsiden, kan du bruge ikonet til at åbne bladet til læsning på skærmen.
Er der et pdf-ikon over forsiden, kan du bruge ikonet til at hente og åbne bladet som pdf.



Skærmlæsemuligheden er væk

Årvågne læsere vil have bemærket, at muligheden for at læse bladet i 'skærmlæse-modus' ikke længere er til stede i bladarkivet.

Årsagen er, at det firma, der fremstillede og hostede skærmlæsemuligheden for os, besluttede sig for at nedlægge funktionen i forbindelse med EU's skærpelse af virksomheders håndtering af personfølsomme oplysninger pr. 25. maj 2018.

Da hjemmesidestatistikken efterfølgende har afsløret, at kun ganske få af vore læsere benyttede funktionen, er det besluttet ikke at erstatte den af en anden tilsvarende.

