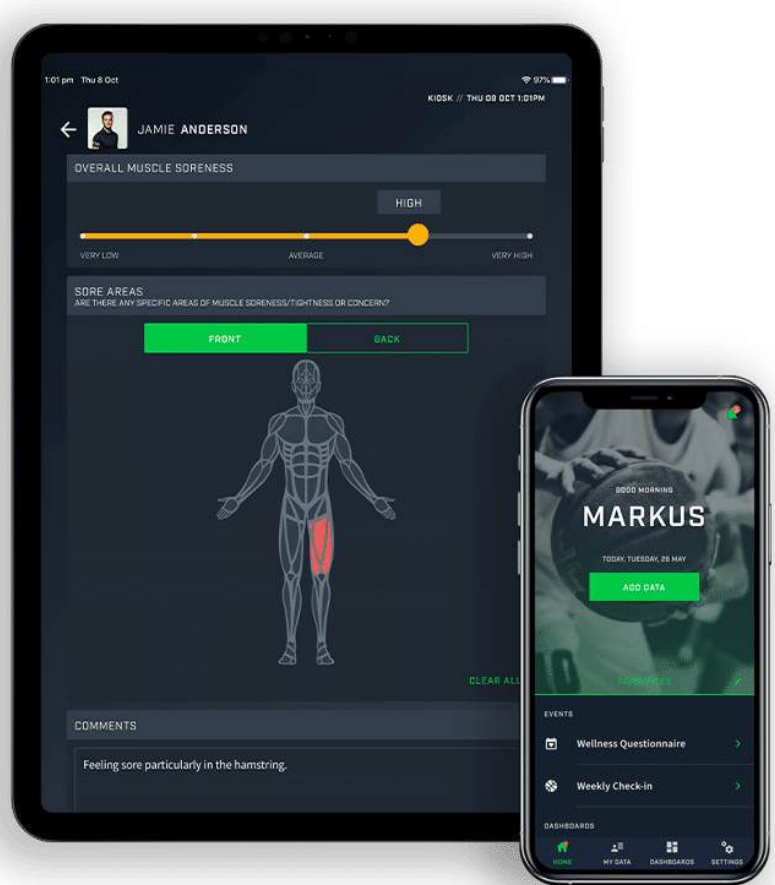


Injury Characteristics in Swedish Elite TeamGym: a 52-Week Prospective Cohort Study – STIC



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Keywords (5): TeamGym, Epidemiology, Prospective, Cohort, Athletic Injuries, OSTRC



Background

TeamGym is a growing gymnastics discipline requiring high technical, mental, and physical skills. Gymnasts often continue to train and compete despite pain, which hides the true burden of injuries. The Oslo Sports Trauma Research Center overuse questionnaire (OSTRC-O), widely used in other sports, is recommended for investigating athletes' pain, complaints and injuries.

Aim

This study aimed to capture injury prevalence, common injured body regions and the phases of gymnastic elements when gymnasts are most vulnerable to injuries.

Methods

Over 52 weeks, this prospective cohort study monitored injuries with approximately a 90 % response rate through weekly assessments using OSTRC-O2 via a mobile app. Participants consisted of 159 elite gymnasts (females, males, juniors, seniors) from the first selection of the Swedish national team in TeamGym.

Results

Our preliminary results indicated a total injury prevalence of 48%. The most affected body regions were the ankle (24%), the knee (17%), and the lower back (12%), with the majority of injuries occurring in the lower limbs (67%). Most injuries had a gradual onset, while those with a sudden onset mainly occurred during landing in trampet and take-off in tumble.

Conclusion

Injury prevalence in TeamGym is high, especially in the lower limbs, with sudden-onset injuries often occurring during take-off and landing. The STIC-study will provide novel insights into injury timing, type, and circumstances in elite TeamGym. Ongoing analyses will report prevalence, incidence, severity, and burden, identifying apparatuses and movement phases linked to injuries.



STIC Swedish TeamGym
Injury Cohort



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Career Prevalence of Concussion among Adolescent Female and Male Handball Players

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- ### Summary
- The overall self-reported career prevalence of concussion among adolescent handball players in this study was 33%, with goalkeepers reporting the highest prevalence.
 - Future research is warranted regarding concussion risk factors, preventive measures, and safe return-to-play strategies in handball.

Introduction

While sports-related concussions are recognised as a serious concern for young athletes, research remains limited regarding the prevalence and risk factors for concussion in handball.

Aim

To investigate the career prevalence of concussion in adolescent handball players and investigate any potential differences based on sex and playing position.

Methods

For this cross-sectional study, baseline data from the Swedish Handball Cohort (SHC) were used, which included 1,655 players from 22 Swedish handball-profiled high schools. The players were invited to participate between 2020 and 2024. At baseline, the participants completed a questionnaire assessing their experiences with current and past concussions sustained during their handball careers. Crude prevalence ratios (PR) were calculated with corresponding 95% confidence intervals (CI).

Results

A total of 1,655 players were included (mean age 16.8 ± 0.9 years; 51% male) from 22 high schools. In total, 548 players reported having experienced a concussion. The overall career prevalence of concussion in the population was 33% (95% CI:30–36).

Goalkeepers reported 76% higher prevalence compared to outfield players (PR 1.76, 95 % CI 1.52–2.03). No difference was observed between male and female players (PR 1.12, 95 % CI 0.97–1.28).

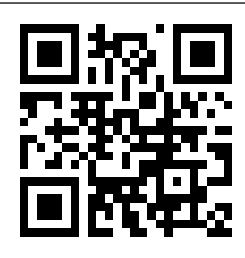
Table 2 Career prevalence and prevalence ratios of self-reported concussion, 2020-2024

	No. of individuals	History of C, n (%)	PR (95 % CI) *
Total	1655	548 (33)	-
Sex			
Males	852	267 (31)	1.0
Females	803	281 (35)	1.12 (0.97–1.28)
Playing position			
Wing	338	77 (23)	1.0
Line	230	74 (32)	1.41 (1.08–1.85)
Back	855	275 (32)	1.41 (1.13–1.76)
Goalkeeper	232	122 (53)	2.31 (1.83–2.91)

C concussion, CI confidence interval, PR prevalence ratio
* Crude

Conclusion

One third of the players at Swedish handball-profiled high schools reported at least one previous concussion during their handball career. Goalkeepers, line players, and back players showed a higher prevalence of concussion compared to wing players. No difference was observed between male and female players.



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Short- & long-term fitness effects in seniors of 8-week exercise repeated over two consecutive years



Figure 1. The 12 measured tests were: isometric trunk flexion and trunk extension (1 & 2), 50 sit-to-stands, including speed & amount of chair raises in 30s (3), shoulder presses (4), 5-sit-to-stands (5), step-height (6), grip strength (7), 6-min walk test (8), Ekblom cycle test (9), time-up-&-go (10), stand-&-reach (11), and one leg balance tests with open & closed eyes (12).

Background

Information on the long-term maintenance of short-term exercise fitness gains measured by field-based tests is scarce in older adults.

Aim

This study aimed to investigate for older adults short- and long-term changes in various physical fitness parameters after an 8-week exercise program performed during two subsequent years in the spring.

Method

In this longitudinal study, a total of 265 participants (62% women; mean-age 71.4±4.7 years) completed a field-based test battery of 12 fitness tests (22 parameters, Fig. 1) at 2 pre-tests and 1 post-test following an 8-week exercise program (2 sessions/week, combining aerobic and strength activities) in 2 consecutive years during the spring season. The tests assessed muscle endurance, muscle strength, cardiorespiratory fitness, and motor fitness. RM-ANOVA with Bonferroni's post-hoc tests was used to detect changes from pre-test 2 to post-test both years (Y1 & Y2, year 1 & year 2, respectively), and from Y1 post-test to Y2 pre-test 2.

Results

Significant short-term improvements were observed, e.g., in isometric trunk flexion and extension endurance strength (21–37%) for both sexes in both years (Y1 and Y2). Lower body muscular endurance improved in the first year (9–12%) for both sexes, while cardiorespiratory fitness (6-min walk test, 6MWT) improved only for men (3%) and shoulder presses for women (23-24%) in both years.

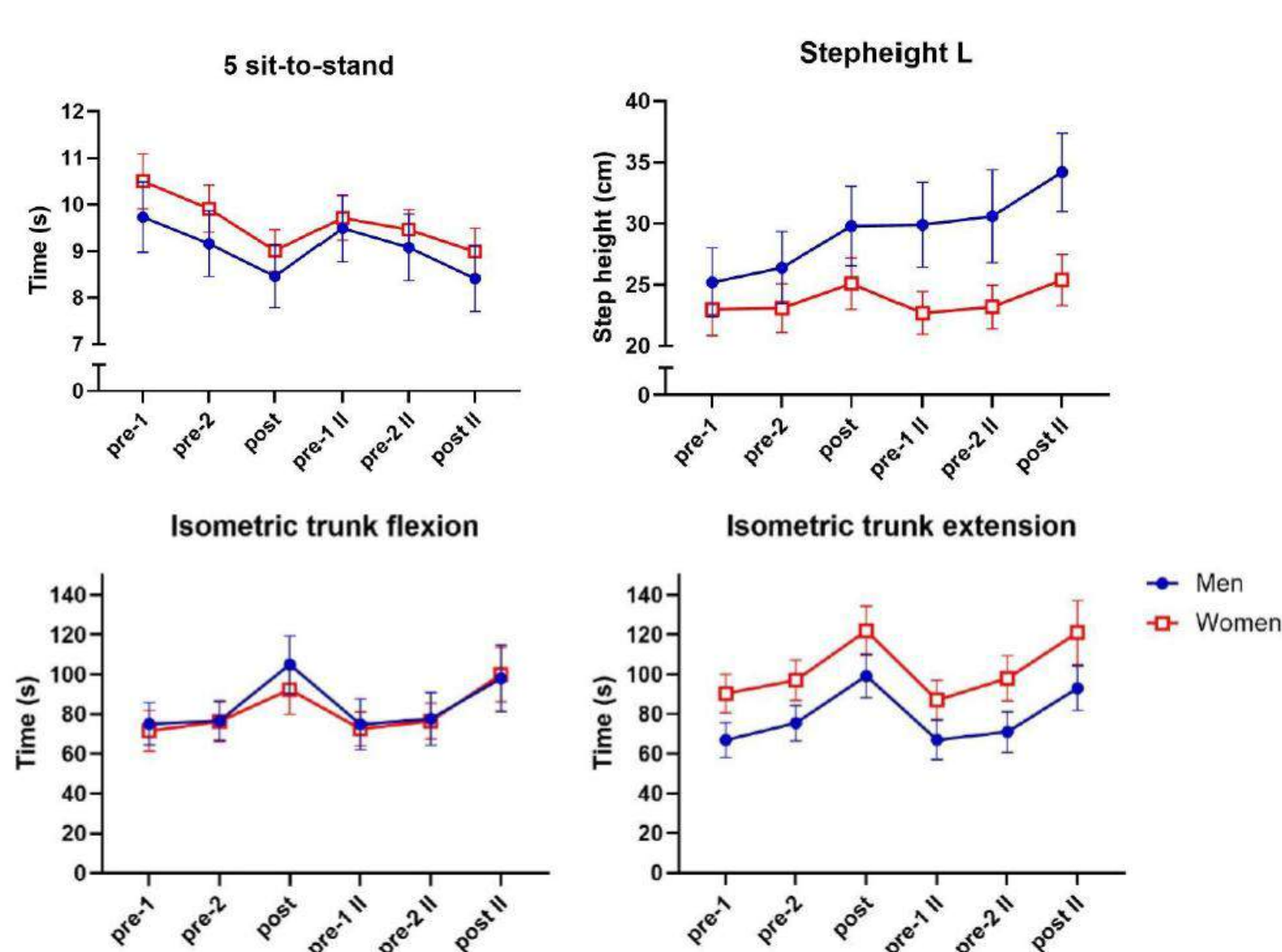


Figure 2. Mean values (with 95% CI) from pre-tests 1 & 2 and pos-tests, year I and II, for 5-sit-to-stand time and maximal step height (left leg), as well as for isometric trunk endurance flexion and extension strength - shown for men (blue circles) and women (red squares) separately.

No changes were seen in submaximal cycle test heart rates, grip strength, or any balance tests in any year.

Most fitness parameters did not significantly decrease during the 9-month inter-intervention period, with a few exceptions in trunk endurance strength and walking distance.

This study demonstrates fitness improvements in older adults following short-term 8-week exercise, and that some of these improvements were maintained long-term, whereas a few of these fitness test improvements decreased significantly over 9 months, for trunk strength & 6-minutes-walk-test. However, these capacities improved again within the 8-week exercise period the following year 2.

Table 1. Changes over time in the fitness tests. Arrows (↑↓) indicate test score direction, and green color suggests improvement, while red indicates a decrease in a test, and no color indicates no significant change.

Test	Post 8-Week Exercise, Spring term I	9-Month Follow-up
Study Population (both sexes)	Community-dwelling n=265 71.4±4.7 years, 62% women,	- Same cohort as 8-week intervention
Intervention	8-week supervised exercise (2sessions/week, 8-60 min)	No structured intervention from post-test and 9-month follow-up
Time Points	Pre & Post 8-week exercise	9 months after 8-week program
Muscular Endurance		
Isometric trunk flexion (s)	↑ 21-37%, (both sexes)	↓ 26% men from post-test year I No significant change women
Isometric trunk extension (s)	↑ 26-32%, (both sexes)	↓ 20-29% from post-test from yr I
30s sit-to-stand (n)	↑ 9-12%	Maintained (no sign. decrease)
Sit-to-stand speed (n/s)	No significant changes	Maintained (no sign. decrease)
Shoulder press (n)	No change men ↑ 23% women	Maintained (no sign. decrease)
Muscular Strength		
5 sit-to-stand (s)	↓ 8-9% (both sexes)	Maintained (no sign. decrease)
Step height Left leg (cm)	↑ 13% (left leg) men No change women	Maintained (no sign. decrease)
Step height Right leg (cm)	No change (right, both sexes)	Maintained (no sign. decrease)
Grip strength (N)	No significant changes	Maintained (no sign. decrease)
Aerobic Fitness		
6MWT (m)	↑ 3% men, No significant change women	↓ 3.3% men from post-test year I No sign. change women
Motor Fitness		
TUG (s)	No significant changes	Maintained (no sign. decrease)
Stand and reach (cm)	No significant changes	No significant changes
Balance (various tests)	No significant changes	No significant changes

Conclusion

Both similarities and variations in fitness effects between sexes and across the two studied periods were seen. Encouragingly, fitness levels were maintained in several fitness tests after 9 months of follow-up.



Gymnasts’ experience of rehabilitation and return to sport following a cruciate ligament injury

- A survey study on Swedish gymnasts

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Conclusions

Gymnastics is a complex sport, and therefore, its rehabilitation poses challenges. The gymnasts highlighted a multitude of important factors for their rehabilitation and return to sport (RTS). They also experienced numerous shortcomings that need addressing to make future rehabilitation and RTS more successful.

Objectives

Examine Swedish gymnasts’ experience of rehabilitation and RTS following a cruciate ligament injury.



Photo: Brett Wharton

Method

Online survey March to December 2023. Additional data extracted from the Swedish National Knee Ligament Registry, May 2024. Descriptive data were processed, and association tested using Pearson’s χ^2 .

Participants

Forty-three gymnasts (female/male (38/5); TeamGym (n=38), high-level (n=34), mean age at the time of injury 19 (6.45), participated at different stages of their rehabilitation.

Highlights

- The gymnast’s *attitudes* and *self-efficacy* are important for rehabilitation and RTS
- *Clear information* about the injury, rehabilitation, and RTS should be provided
- *Clear goals, structured progressions, and planning for setbacks*, are important
- *Commitment* from, and *collaboration* between, medical personnel and the coach is important
- *Adequate testing and support* are needed during RTS preparations
- Many gymnasts did not feel *mentally*, or *physically*, ready at the time of RTS
- Rehabilitation *together with others* was seen as the *least* important factor
- Medical personnel’s *knowledge of gymnastics* is associated with the *gymnastic relevance* of exercises

Results

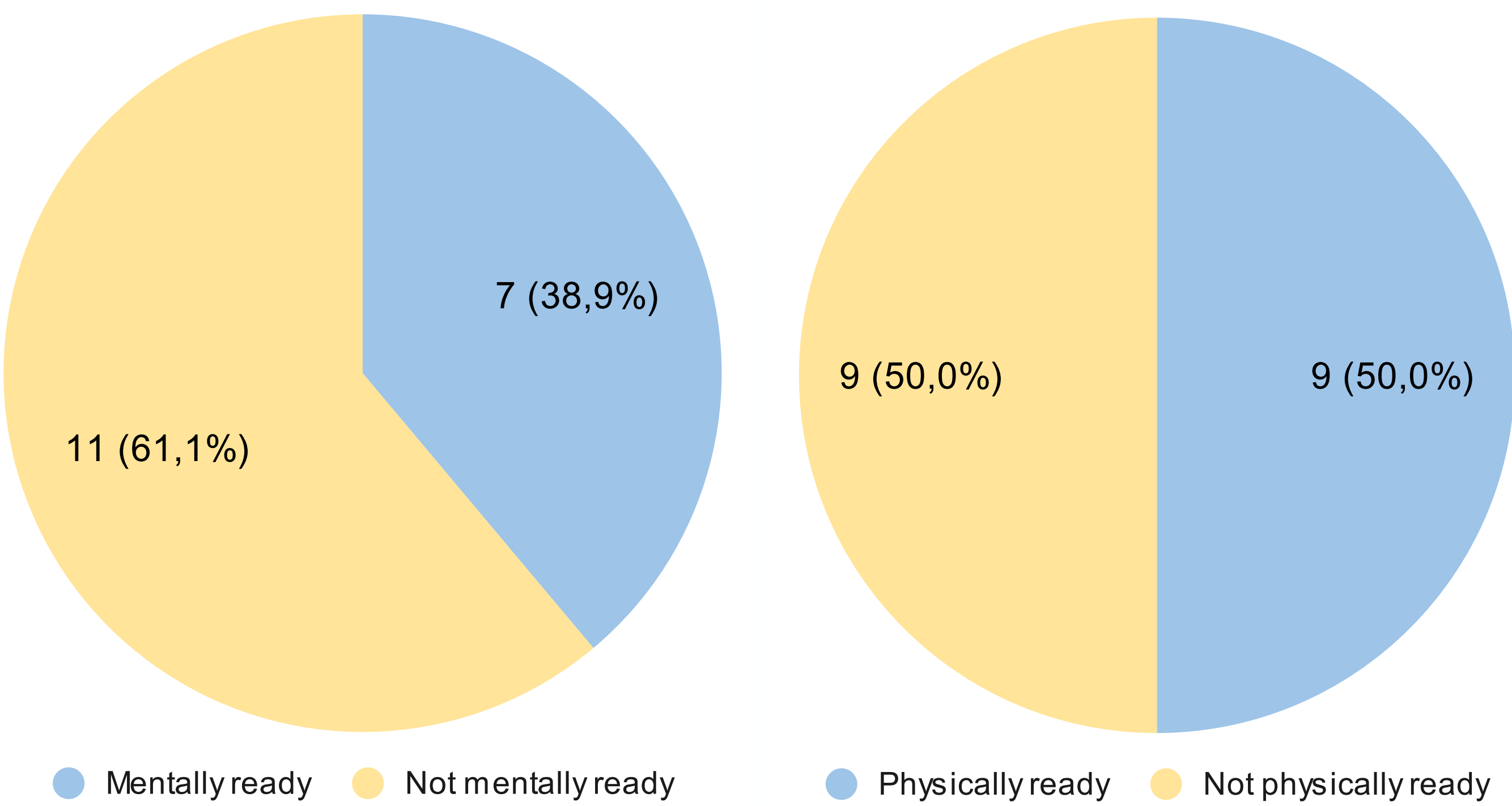
Eight gymnasts (21%) experienced satisfactory collaboration between the medical personnel and coach, 13 (57%) received sufficient help during RTS, and 10 (26%) perceived the plan for managing setbacks as satisfactory.

Self-efficacy (n=43, 100%), clear information about the injury (n=43, 100%), the gymnast’s attitude (n=42, 98%), and testing of knee function (n=42, 98%) were most important to the gymnasts, and rehabilitation with others was least important (n=8, 19%).

Seven gymnasts (39%) felt mentally ready, and 9 (50%) felt physically ready when returning to sport.

The medical personnel’s knowledge of gymnastics was associated with exercise’s gymnastics relevance (n=25, $\chi^2=12.3$, $p<.001$), where better gymnastics knowledge provided higher relevance.

Perceived Readiness at RTS



Caroline Söderström

“To promote equal healthcare and successful RTS, a standardized rehabilitation protocol should be developed. And an information folder aimed at gymnasts might further enhance the quality of the rehabilitation.”



Marita Löfgren Harringe



Career Prevalence of Cruciate Ligament Injury among Male and Female Adolescent Handball Players

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Introduction

Cruciate ligament (CL) injuries in youth sports remain a major concern despite prevention efforts. They may lead to reinjury, physical and psychological challenges, and chronic knee issues, requiring extensive treatment.

Aim

To investigate the career prevalence of CL injury in adolescent handball players and potential differences between sex and playing position.

Methods

For this cross-sectional study, data from the Swedish Handball Cohort was used, including 1,655 players from 22 Swedish handball-profiled high schools. The players participated between 2020 and 2024. At baseline, the participants completed a questionnaire reporting current CL injury or CL injury sustained during their career. Crude prevalence and prevalence ratio regarding sex and playing position were calculated, with 95% confidence intervals.

Conclusion

CL injuries are common among adolescent handball players, affecting approximately 7%. CL injury is twice as prevalent among female players compared to male players. Additionally, back players are more affected than goalkeepers.

Funding: Sophiahemmet Foundation, The Swedish Naprapathic Association, The Swedish Research Council for Sport Science

Summary

- The overall self-reported career prevalence of CL injury among adolescent handball players in this study was 7%.
- Females and back players reported the highest prevalences.

Results

In total, 120 players reported at least one CL injury during their career. The overall prevalence of CL injury in the population was 7% (95 % CI: 6-9%).

Female players reported twice as high prevalence of CL injury as male players (PR 2.0, 95% CI 1.3-2.9). The prevalence was also higher for back players compared to goalkeepers (PR 3.4, 95% CI 1.5-7.2).

Table 1 Career prevalence and prevalence ratios of CL injury, 2020-2024

	No. of individuals	CL injury (%)	PR (95% CI)*
Total	1655	120 (7)	-
Sex			
Male	852	42 (5)	1
Female	803	78 (10)	2.0 (1.3-2.9)
Playing position			
Goalkeeper	232	7 (3)	1
Wing	343	15 (4)	1.4 (0.6-3.5)
Line	231	12 (5)	1.7 (0.7-4.3)
Back	849	86 (10)	3.4 (1.5-7.2)

CL injury - Number of players with CL injury, PR - Prevalence ratio

* Crude



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SOPHIA HEMMET
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Factors Associated With the Achievement of a Patient Acceptable Symptom State Five Years After ACLR

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Background

Patient reported outcome measures such as Knee Injury and Osteoarthritis Outcome Score (KOOS) are commonly used after anterior cruciate ligament reconstruction (ACLR), but absolute scores can be difficult to interpret. The Patient Acceptable Symptom State (**PASS**) provides patient-centered thresholds for satisfactory results, anchoring outcomes in the patient’s own perspective rather than solely in statistical or clinician-defined measures.

Aim

To determine the proportion of patients and the factors associated with the achievement of a PASS 5 years after primary ACLR.

Methods

- Patients who underwent primary ACLR between 2005–2018 were included
- Primary outcome: Achievement of a PASS on each KOOS subscale at the 5-year follow up
- Multivariable logistic regression analyses were used to assess associations with age, sex, time from injury to surgery, pre-injury Tegner activity level, graft type, cartilage injury, meniscal resection or repair, and symmetrical 6-month limb symmetry index (LSI ≥90%) in isokinetic extension and flexion strength and single-leg-hop (SLH) performance.

Results

- 2663 patients were analyzed
- The proportion of patients achieving a PASS varied between the KOOS subscale as follows:
 - Pain, 64.8%,
 - Symptoms 93.8%,
 - Activities of Daily Living (ADL) 49.1%;
 - Sport and Recreation (Sport&Rec) 65.4%
 - Quality of Life (QoL) 73.5%.

Table 1. Factors associated with PASS in different subscales of KOOS 5 years after ACLR

	Pain	Symptoms	ADL	Sport&Rec	QoL
Age ≥30 years	Associated with PASS	Associated with PASS	Associated with PASS	Associated with PASS	Associated with PASS
Female sex	Reduced odds of achieving PASS	Reduced odds of achieving PASS	Not associated	Reduced odds of achieving PASS	Reduced odds of achieving PASS
Surgical delay ≥3 months	Not associated	Not associated	Not associated	Not associated	Reduced odds of achieving PASS
Medial meniscus repair	Not associated	Not associated	Not associated	Reduced odds of achieving PASS	Reduced odds of achieving PASS
Hsmstring tendon autograft	Not associated	Not associated	Not associated	Associated with PASS	Not associated
LSI ≥90% isokinetic extension strength	Not associated	Not associated	Associated with PASS	Not associated	Associated with PASS
LSI ≥90% in SLH performance	Not associated	Associated with PASS	Associated with PASS	Associated with PASS	Associated with PASS

Green box indicates that the factor is associated with PASS while red box indicates that the factor is negatively associated with PASS. The other factors that are not summarized in the table were not associated with PASS.
ACLR, Anterior Cruciate Ligament Reconstruction; ADL, Activities of Daily Living; KOOS, Knee Injury and Osteoarthritis Outcome Score; LSI, Limb Symmetry Index; PASS, Patient Acceptable Symptom State; QoL, Quality of Life; SLH, Single-Leg-Hop; Sport&Rec, Sport & Recreation

Conclusion

The achievement of a PASS was over 64% on at least four out of five KOOS subscales. Older age (≥30 years) was consistently associated with higher odds of achieving a PASS, while female sex was associated with lower odds.

Longitudinal follow-up of running injury incidence in recreational runners in relationship to the use of Advanced Footwear Technology shoes

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Introduction

Advanced Footwear Technology (AFT) running shoes have been associated with improved running performance (1). Recently, attention has been drawn to potential injury risks in AFT shoes due to the altered foot and ankle mechanics (2). The modified mechanics may increase the injury risk due to increased loading of plantarflexing muscles and tendons or mediolateral stability. No longitudinal study investigating the occurrence of running-related injuries (RRI's) in relation to the use of AFT shoes has been reported to date.

Purpose

This study aimed to examine the prevalence of AFT shoe use in recreational runners in Sweden and to determine whether runners predominantly using AFT shoes have an increased risk of RRI's.

Methods

The process followed for the study is outlined in Figure 1. Inclusion criteria were: runners >18 years old, participating in running events and a good understanding of the Swedish language.

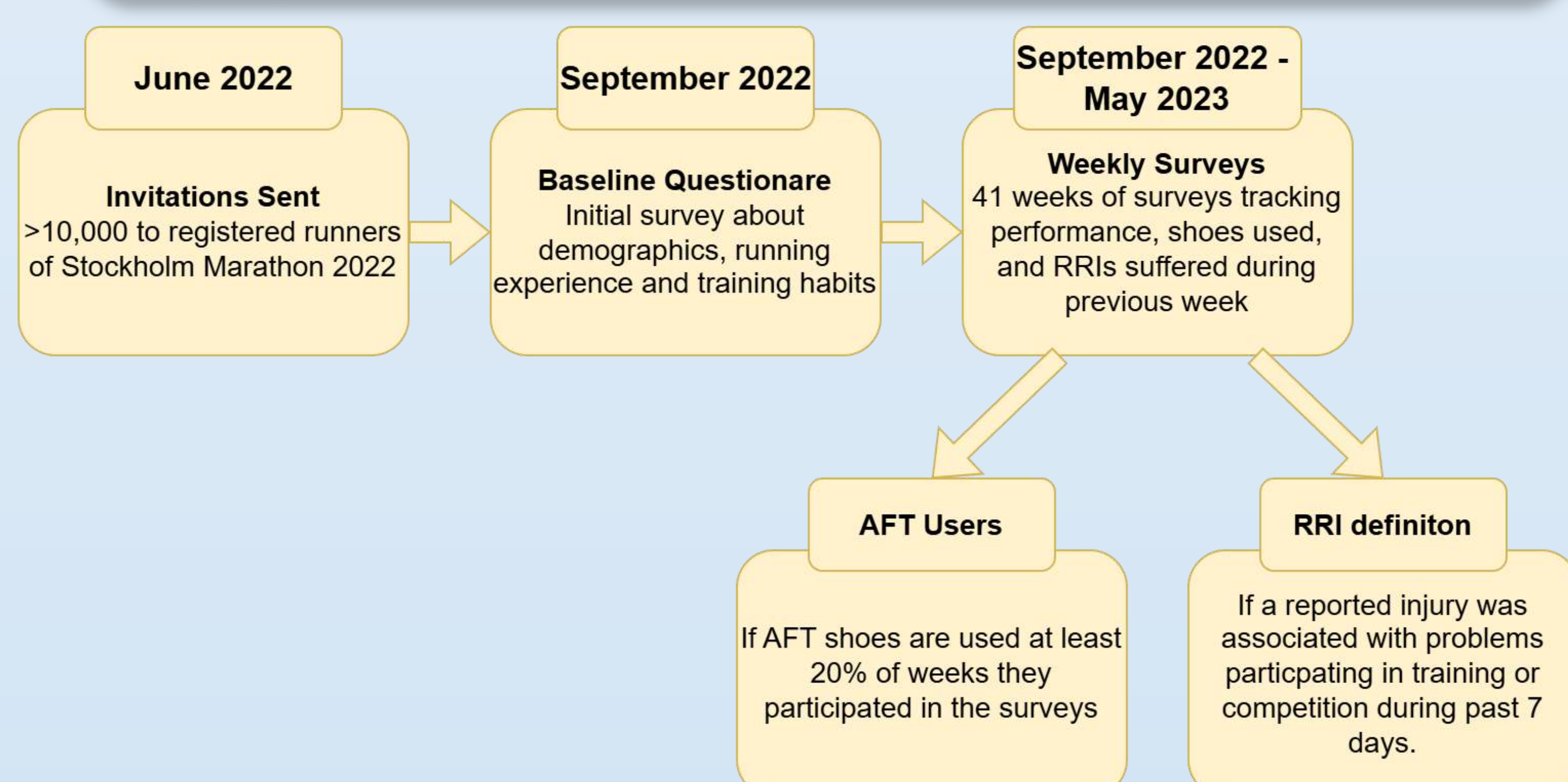


Figure 1. Study timeline and details.

Results

271 recreational and elite runners fulfilled the inclusion criteria and participated in the study. On average, 240 (89%) responded each week during the 41-week study period. Unadjusted comparisons between the AFT-user and non AFT-user groups of runners were made by the Wilcoxon rank-sum test. Selected, relevant group characteristics are described in Table 1.

Results

105 (39%) runners fulfilled the AFT-user definition. The AFT users ran longer distances ($p<0.05$) and faster ($p<0.05$) compared with non-users (Table 1).

Table 1. Selected characteristics of AFT-users and non AFT-users

	AFT-users	Non AFT-users	p
Distance/w, km: mean (SD)	47.93 (24.18)	34.85 (23.77)	<0.001
Pace/km, min:sec: mean (SD)	05:39 (0:42)	05:59 (0:46)	<0.001
RRI reported, n (%)	66 (63)	96 (58)	0.487

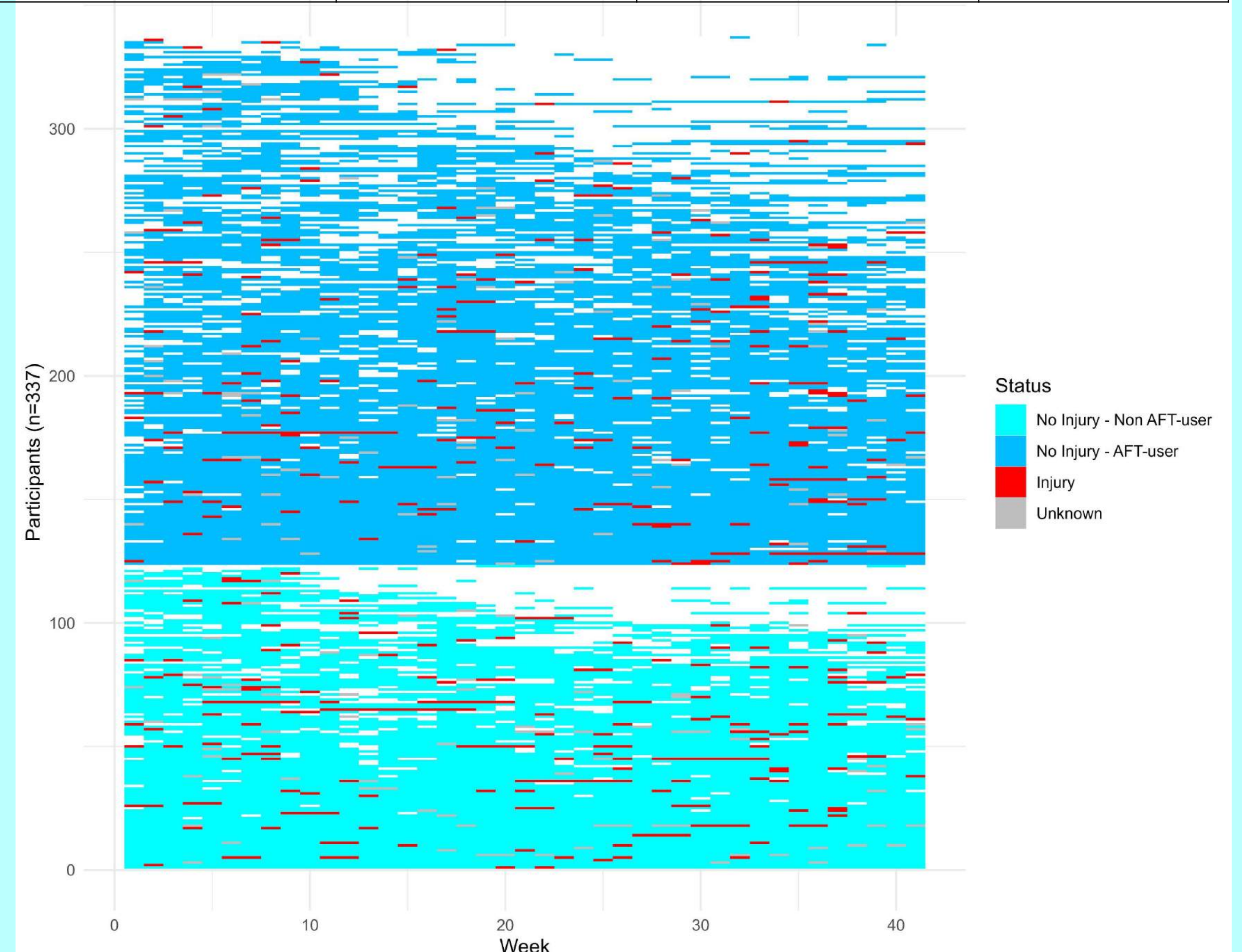


Figure 2. Injury occurrence for AFT users and non-AFT-users.

Discussion

AFT users covered longer running distances and also ran at a faster pace than the non AFT-users. These factors would be expected to be associated with greater loading and potentially a higher injury occurrence. However, the proportion of runners reporting RRI's did not differ significantly between AFT-users and non AFT-users in our unadjusted analyses. Further analyses will focus on RRI patterns controlling for running experience and physical loading dynamics.

Conclusion

No significant difference was seen in the occurrence of running-related injuries in recreational runners running predominantly in AFT shoes compared to non AFT-shoes over a 41-week study period.

COMPARISON OF THE MAGNITUDE DIFFERENCES IN RESULTANT KNEE JOINT REACTION FORCE WHEN MODELLING WITH AND WITHOUT MUSCLES

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Summary

The current study evaluated and compared knee joint reaction forces (KJRF) during countermovement jumps with Visual 3D (V3D; C-motion, Germantown, MD, USA) and the AnyBody Modelling System (AMS; AnyBody Technology, Aalborg, Denmark). KJRF from AMS, which incorporated internal muscle forces, were 5.9 times higher than V3D estimates. The findings emphasize that excluding muscle contributions when calculating KJRF underestimates joint loads and presumably injury risk and tissue loading.

Introduction

Some software used in biomechanical research provides pipelines to calculate a net joint force, without considering the internal forces that the definition of joint reaction force depends on, most importantly due to muscles. The use of the net joint force in studies investigating joint loading may lead to underestimated joint reaction forces and thus underestimation of the risk of tissue failure [1]. The current study aims to compare the magnitude of resultant knee joint reaction forces (KJRF[R]) derived from two different calculation methods.

Methods

Eleven uninjured male participants (mean age 25.5 years) performed countermovement jumps on dual force plates (Kistler GmbH, Winterthur, Switzerland) and kinetics and kinematics were registered in QTM (Qualisys Track Manager; Qualisys, Göteborg, Sweden). KJRF[R] was calculated independently in V3D (Net force: muscle forces excluded), and AMS (Reaction force: muscles forces included).

Results and Discussion

KJRF[R] calculated with AMS was 4.6-6.2 times higher than KJRF[R] calculated in V3D (Figure 1). Previous calculations of KJRF using musculoskeletal models have shown similar KJRF as direct measurements in an instrumented knee [2].

The current study clearly showed that net force computed by V3D underestimated KJRF[R] because the exclusion of muscle forces on KJRF (Figure 1 & Table 1). Using a net force in biomechanical investigation of knee joint loading may lead to a misinterpretation of the loads [1]. The application of a musculoskeletal model is therefore necessary for accurately answering questions regarding joint loading.

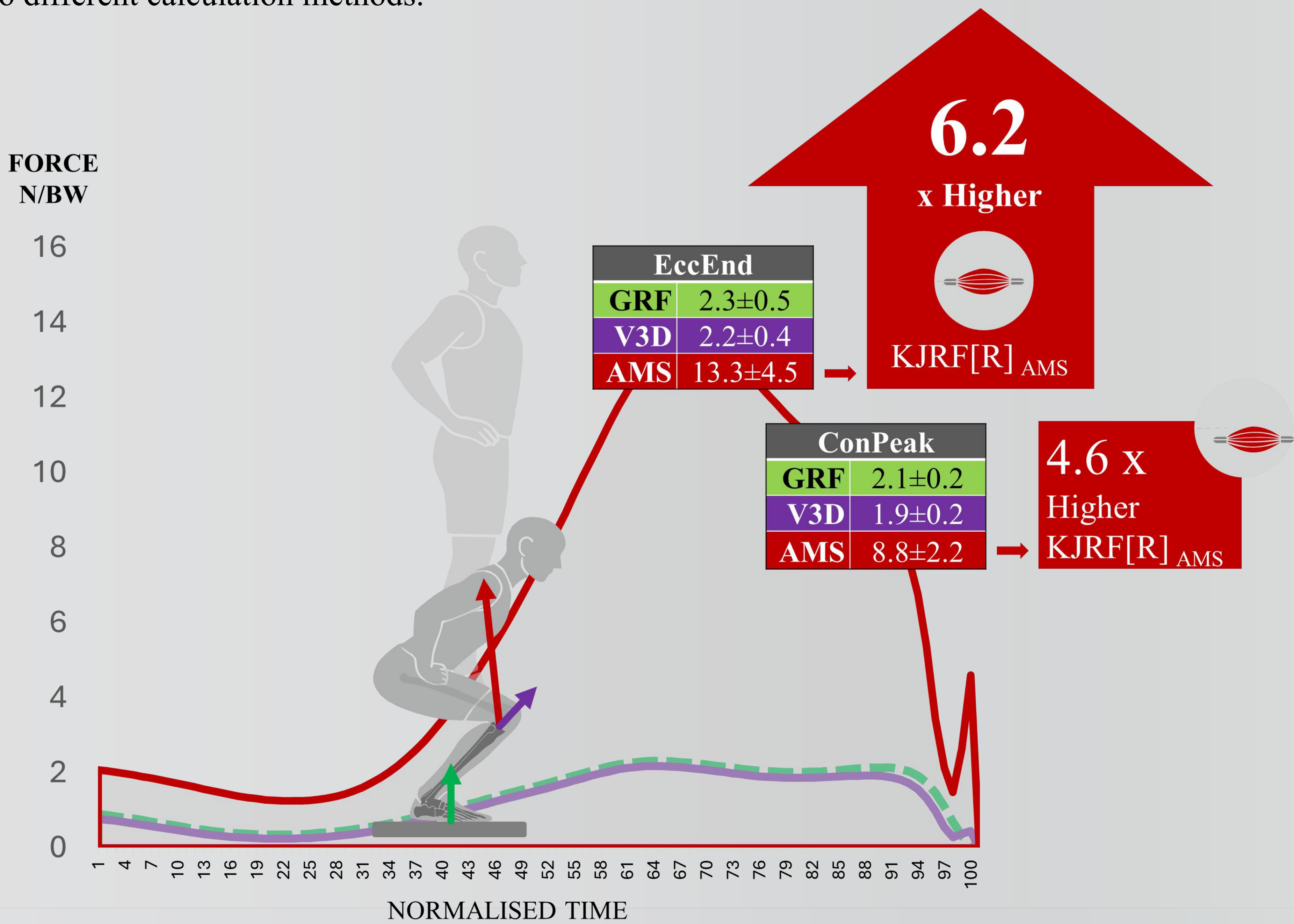
Conclusion

This study emphasises the need for musculoskeletal modelling when assessing joint loading and presents limitations of using a net force in biomechanical investigations.

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The Incidence of Venous Thromboembolism in Patients Undergoing Anterior Cruciate Ligament Repair: A Proposed Thromboprophylaxis Regime

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Introduction

ACL reconstruction is a common orthopaedic procedure. ACL reconstruction procedures come with the risk of complications such as deep vein thrombosis and pulmonary embolisms.

The incidence of symptomatic DVT following an ACL reconstruction is reported to be between 0.5-2.2% with very few studies investigating the use of thromboprophylaxis. Post-operative VTE prophylaxis following ACL reconstruction remains non-standard practice and the decision mainly depends on the operating surgeon.

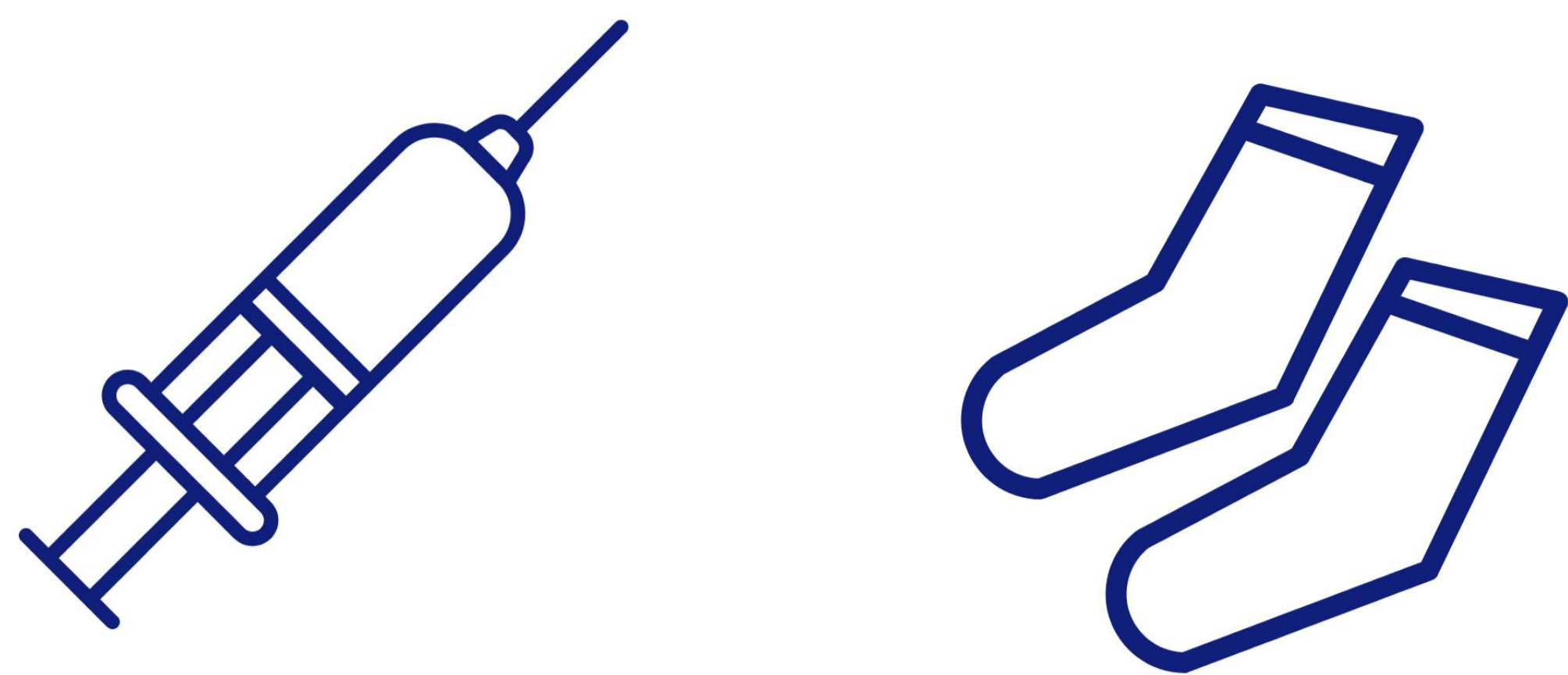
NICE guidelines recommend 2 weeks of prophylactic enoxaparin following lower limb orthopaedic procedures with a total anaesthetic time >90 minutes. ACL reconstructions can be lengthy procedures and can have prolonged anaesthetic time.

Aims and objectives

We are proposing a standard VTE prophylaxis regime. This regime is comprised of 14 days of:

- Prophylactic dose enoxaparin and
- Thromboembolic deterrent stockings (TEDS)

We evaluate and report the incidence of symptomatic venous thromboembolisms (VTEs) post ACL reconstruction using 14 days of chemical prophylaxis with enoxaparin along with mechanical prophylaxis with TEDS.



Materials and methods

A retrospective cross sectional observational study carried out on patients who underwent ACL reconstruction at the George Eliot Hospital NHS Trust between 26/03/2015 and 09/11/2023.

Patients were given 14 days of TEDS and 40mg enoxaparin once a day. All patients were routinely reviewed in the outpatient clinic at 2 and 12 weeks. Records of patients were reviewed for the incidence of VTE. All patients were asked specifically at their 3-month review if they had undergone any VTE investigations or treatments elsewhere. All Patients were day cases and underwent a standardised post-operative physiotherapy programme.

- Primary outcome measure: incidence of symptomatic DVT up to 12 weeks post-operatively
- secondary outcomes being wound-related complications or bleeding incidents up to 12 weeks post-operatively
- Other variables such as age, gender, ACL graft type, associated meniscal injury, revision status, total anaesthetic, surgical and tourniquet time recorded

REFERENCES

Results

155 patients identified:

- Average age 27.1 years

Procedure type:

- 145 Patients had four strand hamstring grafts
- 8 had ligament augmentation and reconstruction system (LARS)
- 2 had a hamstring allograft

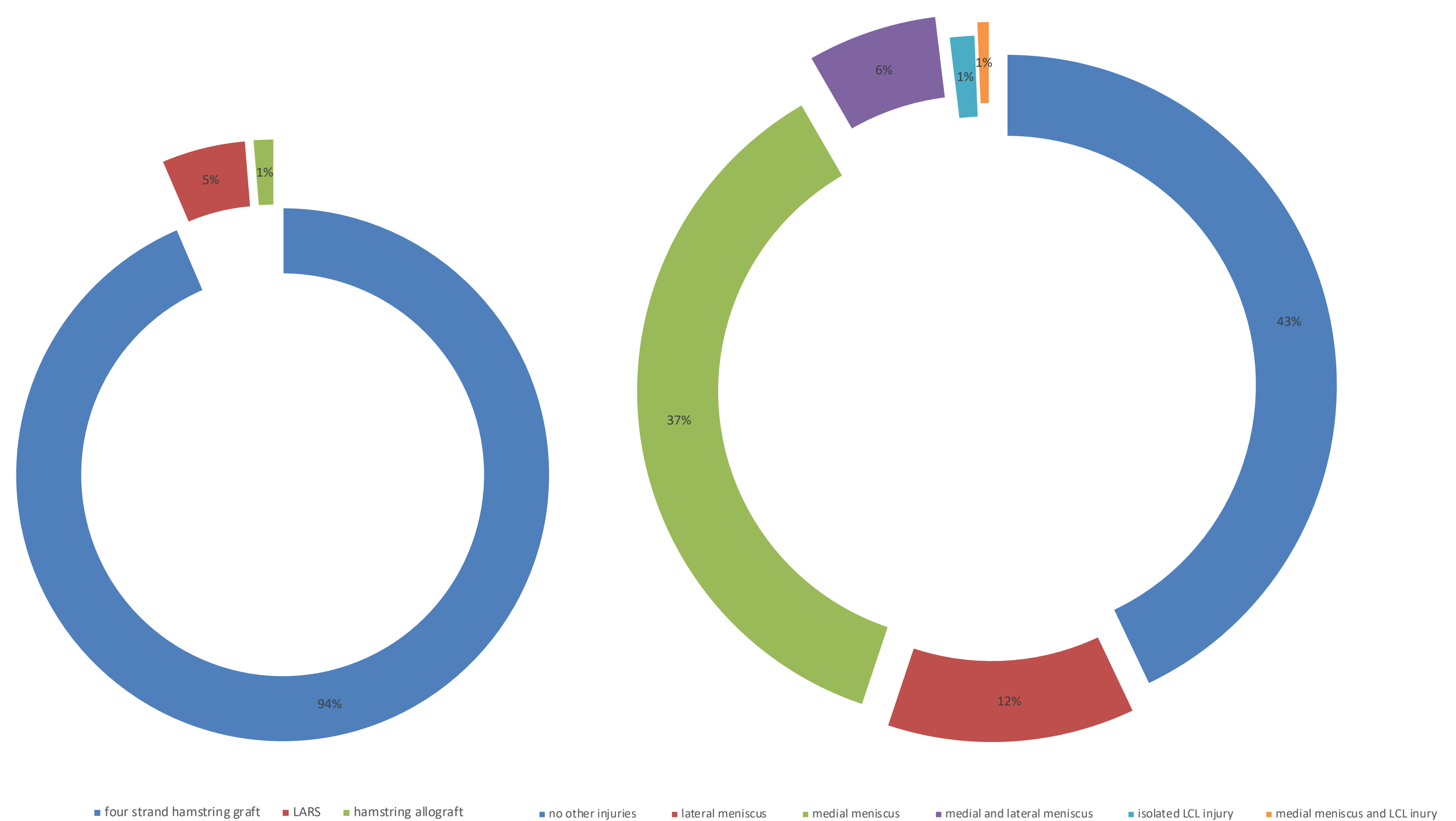
Other injuries:

- 88 had an associated meniscal injury
 - 19 lateral meniscal injuries
 - 57 medial meniscal injuries
 - 10 both medial and lateral meniscal injuries
- 2 isolated LCL injuries. Meniscal trimming was performed in 34 patients while repair was performed in 54 patients. 18 out of 155 were revision procedures
- One patient had a medial meniscal as well as lateral collateral ligament (LCL) injury

Total times shown in the table

With 14 days of TEDS and prophylactic enoxaparin:

- 0 had symptomatic DVT up to 12 weeks post procedure
- 0 had delayed wound healing, infections bleeding incidents



	anaesthetic	surgical	tourniquet
average total time (minutes)	145 (+/- 24.8)	122 (+/- 25.3)	82.1 (+/-23.8)

Conclusion

This study proposes a combined chemical and mechanical thromboprophylaxis regime post ACL reconstruction. We demonstrates a 0% incidence of clinically symptomatic VTEs using this regime

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