Energy requirements and physical demands of professional football players during rehabilitation from an anterior cruciate ligament reconstruction

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Ethical review	Approved WMO
Status	Pending
Health condition type	Other condition
Study type	Observational non invasive

Summary

ID

NL-OMON56686

Source
ToetsingOnline

Brief title
ProRecovery

Condition

- Other condition

Synonym
dietary requirements, nutritional requirements

Health condition

Energie- en voedingsbehoeften van profvoetballers

Research involving

Human

Sponsors and support

Primary sponsor: Hogeschool van Arnhem en Nijmegen
Source(s) of monetary or material Support: interne bekostiging door Hogeschool van Arnhem en Nijmegen

Intervention

Keyword: Anterior Cruciate Ligament, Energy requirements, Nutrition, Physical activity

Outcome measures

Primary outcome

The primary endpoints of the current study are total daily energy expenditure determined by the DLW method, ~1, 7, 16, 22 and 30 weeks post-surgery, along with measurements of the resting metabolic rate by ventilated hood (Q-NRG, Cosmed). When the total daily energy expenditure and resting metabolic rate are known, the energy expenditure from physical activity can be calculated. Therefore, this study will provide reference values for energy requirements during different phases of the rehabilitation process.

Secondary outcome

The secondary endpoints of the current study are physical activity-, resting-, and sleeping patterns as determined by wearable non-obtrusive physical activity monitors (ActiGraph GT9X). The physical activity monitors measure the daily duration of sedentary behaviour, light physical activity, moderate physical activity, and strenuous physical activity, respectively. Also the timing of physical activity and rest will be determined. Physical activity on the field is monitored by local position monitoring (LPM) system, which is part of the standard KNVB rehabilitation protocol and will be conducted by the KNVB

Football Medical Centre. Another secondary endpoint of the current study is body composition by anthropometry (by ISAK standards), which is part of the standard KNVB ACL rehabilitation protocol.

Study description

Background summary

Anterior Cruciate Ligament (ACL) rupture has a great impact on athletes, emphasizing the challenges it poses to an athlete's career due to surgery and a prolonged rehabilitation period. The return-to-sport rates vary, with professional male football players showing a nearly 100% return, but only 65% at the same level three years post-reconstruction. The risk of re-rupture is significant, especially in females, but may be reduced with an optimal rehabilitation.

The rehabilitation process at the KNVB Football Medical Center spans four phases over approximately nine months, focusing on recovery, muscle strength, neuromuscular control, running, agility, jumping, and prevention of recurrence. During rehabilitation, athletes experience a drastic change in activity patterns, impacting energy expenditure.

Besides changes in activity pattern, several physiological consequences occur after an ACL rupture. The energy requirement might decrease due to immobilization. However, energy and macronutrient intakes should still be adequate to reduce muscle loss, and mitigate the negative effects of surgery and immobilization. Physical demands will gradually increase and differ per phase during the rehabilitation period, so do the nutritional requirements. However, to date it is unclear what exact energy requirements are and how they develop throughout the rehabilitation period.

Therefore this study aims to explore the energy requirements of professional football players during different phases during the rehabilitation from an ACL reconstruction. Total daily energy expenditure, resting metabolic rate, physical activity, and body composition will be assessed. The goal is to provide insights into the evolving nutritional needs during rehabilitation and form best-practice nutrition strategies for the rehabilitation from an ACL reconstruction.

Study objective

In the current study, we aim to assess the energy requirements of professional

football players during different phases in the rehabilitation from an ACL reconstruction. As such, this study will identify the energy and nutritional requirements, adjusted to the evolving physical demands of the ACL-rehabilitation period. Hence, this study forms the basis for a best-practice nutrition protocol for optimal recovery from an ACL-reconstruction.

Study design

The current study is a longitudinal cohort study, with repeated assessments of energy expenditure, physical activity patterns, body composition and dietary intake during a rehabilitation period of ~9 months. For all participants, data will be collected from ~1 week post-surgery until the end of the rehabilitation period (~36 weeks post-surgery). In the regular protocol, DLW measurements will take place in the first and second phase of rehabilitation. For the extended protocol, additional measurements with DLW will be conducted in two participants.

For all participants, between 5 to 10 days post-surgery (~week 1) and in week 7, energy expenditure will be determined by the doubly labelled water method for a period of 2 weeks. These measurements require the ingestion of a single bolus of doubly labelled water, combined with repeated urine collections over a 2-week period. Along with the DLW method, the resting metabolic rate will be measured by ventilated hood indirect calorimetry, and physical activity patterns will be assessed by physical activity monitors (wrist-worn accelerometers and local position monitoring). All physical activity will also be logged in an activity diary. The energy expenditure by DLW, RMR and physical activity will again be monitored around weeks 16, 22 and 30 (1 week after the start of a new phase in the field rehabilitation) in the *DLW extended protocol*. For the regular protocol, only physical activity and RMR will be measured again, without DLW.

Anthropometric measurements will be conducted as soon as possible after surgery. These anthropometric measurements include body weight, height, skinfold thickness and several girths. Anthropometric measurements will continue throughout the rehabilitation period in intervals of ~5 weeks. Additionally, dietary habits and food intake will be assessed by the dietary history method, and will repeatedly be monitored. Both monitoring of the food intake and anthropometry by ISAK are already part of the standard KNVB ACL-rehabilitation protocol.

Study burden and risks

Potential value of the research
The study provides novel insight into the energy expenditure, resting metabolic rate, physical activity patterns, body composition changes and dietary intake

in professional football players during different phases in the rehabilitation of an ACL-reconstruction. As such, this study eventually provides an important framework for dietary counselling in long-term rehabilitating professional football players.

Benefits participants
For the participating football players, their rehabilitation period will be optimised directly. After each dietary history, ISAK measurement and RMR assessment, participants will receive direct feedback and their nutritional advice will be adjusted accordingly.

Risk for participants
Energy expenditure will be assessed by the DLW method, on two or five different time points. Because the stable isotopes used in the DLW are non-radioactive, and non-toxic in the doses used, the DLW method has been used extensively in human volunteers, and even in infants and pregnant women. Per DLW assessment period, collection of 7 urine samples over a period of 14 days is required, which poses minimal burden to the participants.

Furthermore, the burden associated with the assessment of the resting metabolic rate is limited to an investment of maximally 5x50 min in the morning. Participants do have to arrive and stay in a fasted state, which can actually be seen as a short delay in breakfast consumption. An overnight stay in a hotel at, or near the KNVB Campus will be offered to minimize the discomfort. The wrist-worn physical activity monitor does not hinder daily activities, but may provide minimal discomfort for the participants. The dietary history and ISAK measurements are already part of the standard rehabilitation protocol at the KNVB Medical Center.

Altogether, it can be concluded that the burden and risks associated with this study are low.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adolescents (16-17 years)
Adults (18-64 years)

Inclusion criteria

Professional football players
Anterior cruciate ligament rupture
16-40 years

Exclusion criteria

Other long term injuries, other than ACL
Previous ACL rupture and rehabilitation (<2 years)
Meniscal repair or partial meniscectomy at the time of ACL reconstruction, resulting in extended medical care or a second surgical procedure
Pregnancy

Study design

Design

Study type: Observational non invasive

Masking:	Open (masking not used)
Control:	Uncontrolled

Primary purpose:	Diagnostic

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-04-2024
Enrollment:	12
Type:	Anticipated

Ethics review

Approved WMO

Date:	08-04-2024
Application type:	First submission
Review commission:	METC Z: Zuyderland-Zuyd (Heerlen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL85934.096.24