

Preventive exercises reduced injury-related costs among adult male amateur soccer players: a cluster-randomised trial

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Question: Is an injury prevention program consisting of 10 exercises designed to improve stability, muscle strength, co-ordination, and flexibility of the trunk, hip and leg muscles (known as *The11*) cost effective in adult male amateur soccer players? **Design:** Cost-effectiveness analysis of a cluster-randomised controlled trial. **Participants:** 479 adult male amateur soccer players aged 18–40 years. **Intervention:** The intervention group was instructed to perform the exercises at each training session (2 to 3 sessions per week) during one soccer season. The exercises focus on core stability, eccentric training of thigh muscles, proprioceptive training, dynamic stabilisation, and plyometrics with straight leg alignment. The control group continued their usual warm-up. **Outcome measures:** All injuries and costs associated with these injuries were compared between groups after bootstrapping (5000 replications). **Results:** No significant differences in the proportion of injured players and injury rate were found between the two groups. Mean overall costs in the intervention group were €161 (SD 447) per athlete and €256 (SD 555) per injured athlete. Mean overall costs in the control group were €361 (SD 1529) per athlete and €606 (SD 1944) per injured athlete. Statistically significant cost differences in favour of the intervention group were found per player (mean difference €201, 95% CI 15 to 426) and per injured player (mean difference €350, 95% CI 51 to 733). **Conclusions:** The exercises failed to significantly reduce the number of injuries in male amateur soccer players within one season, but did significantly reduce injury-related costs. The cost savings might be the result of a preventive effect on knee injuries, which often have substantial costs due to lengthy rehabilitation and lost productivity. **Trial registration:** NTR2416. [Krist MR, van Beijsterveldt AMC, Backx FJG, de Wit GA (2013) Preventive exercises reduced injury-related costs among adult male amateur soccer players: a cluster-randomised trial. *Journal of Physiotherapy* 59: 15–23]

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Introduction

The beneficial health effect of a physically active lifestyle, eg, engaging in sports, is offset by the accompanying high risk of sports injuries. Sports injuries impose a high economic burden on society, and with about 265 million active players worldwide in 2006 (FIFA 2007), soccer makes a significant contribution to the sports injury problem. The financial loss due to soccer injuries in the professional English football leagues during the 1999–2000 season was roughly estimated at ~€118 million (Woods et al 2002). In Switzerland, with 42 262 soccer injuries in 2003, the annual costs were estimated at ~€95 million augmented by the loss of more than 500 000 working days (Junge et al 2011). In the Netherlands, with a population of 16 million, there are 3.7 million sports injuries each year, with the greatest proportion (620 000 injuries) occurring in outdoor soccer (Consumer Safety Institute 2011). The largest share (75–85%) of all soccer injuries affect the lower extremities (Consumer Safety Institute 2011).

To prevent soccer injuries, training programs have been designed to improve strength, balance, and muscle control of the lower extremities. One of these is a structured injury prevention program called *The11*, developed by the FIFA Medical and Research Centre (F-MARC) to reduce both injury risk and injury severity in soccer. The program

consists of 10 exercises designed to improve stability, muscle strength, co-ordination and flexibility of the trunk, hip, and leg muscles, and advice to promote fair play (Junge et al 2002).

The training program reduced the number of injured adolescent male amateur soccer players (Junge et al 2002), but did not reduce the incidence of injury in adolescent female soccer players (Steffen et al 2008). One reason why no preventive effect was detected in the latter study may be

What is already known on this topic: The structured injury prevention program known as *The11* reduces soccer injuries in different populations but the effect on male amateur soccer players, the largest active soccer population, is still unknown.

What this study adds: Despite not reducing the number of injuries, *The11* nevertheless reduced significantly the overall costs associated with injuries. Savings occurred particularly in indirect non-healthcare costs such as lost productivity. The cost savings may be the result of a preventive effect on knee injuries, which often have substantial costs due to lengthy rehabilitation and lost productivity.

the low compliance among the intervention teams. A recent study investigating the preventive effect of *The11* among Italian male adult amateur soccer players found only minor effects on injury rates (Gatterer et al 2012), but the lack of significant effects in this study may have resulted from the small sample size, generally low injury rates, and lack of randomisation and blinding procedures.

In view of the results of these studies, a randomised study with a large sample size was needed to assess the effectiveness of *The11* among adult male soccer players, in order to provide more evidence. Since adult male soccer players are the largest active soccer population in the Netherlands, and considering their high injury incidence rates (Schmikli et al 2011), implementation of a compact and structured training program such as *The11* could be highly beneficial in reducing the incidence and severity of injuries in this population. Fewer injured players and less severe injuries might also reduce both healthcare costs and the costs of productivity losses associated with injuries. Therefore, the research question for this study was:

Is an injury prevention program consisting of 10 exercises designed to improve stability, muscle strength, co-ordination, and flexibility of the trunk, hip, and leg muscles, cost effective in adult male amateur soccer players?

Method

Design

A two-armed cluster-randomised controlled trial with concealed allocation and intention-to-treat analysis was used to evaluate the cost-effectiveness of *The11*. To avoid contamination, two regional competitions from different regions of the Netherlands were randomised to either the intervention group or the control group. A detailed description of the study design and randomisation procedure is available elsewhere (van Beijsterveldt et al 2011, van Beijsterveldt et al 2012).

Box 1. The injury prevention program (10 exercises).

Exercise	Instructions	Repetitions/duration
1. The Bench	From prone lying, raise head, shoulders, back and hips in a straight line, parallel to the ground, with elbows directly under the shoulders. Lift one leg a few centimetres off the ground.	Hold the position for 15 seconds. Repeat 1–2 times for each leg.
2. Sideways Bench	From side lying with lower knee bent at 90 deg, raise upper shoulder, hip and upper leg in a straight line parallel to the ground. Elbow directly under the shoulders. From above, shoulders, elbow, hips and both knees are in a straight line. Don't drop the hips.	Hold the position for 15 seconds. Repeat twice each side.
3. Hamstrings	Kneel with ankles pinned firmly to the ground by a partner. Slowly lean forward keeping upper body, hips and thighs in a straight line. Try to hold this straight body alignment, using the hamstrings, for as long as possible, then control your fall.	Repeat 5 times.
4. Cross country skiing	Flex and extend the knee of the supporting leg and swing the arms in opposite directions in the same rhythm. On extension, never lock the knee, and don't let it buckle inwards. Keep pelvis and upper body stable and facing forwards. Keep pelvis horizontal and don't let it tilt to the side. Flex and extend each leg.	15 times.
5. Chest-passing in single-leg stance	Stand on one foot. Keep knees and hips slightly bent. Keep weight only on the ball of the foot, or lift heel from the ground. From the front, hip, knee and foot of the supporting leg should be in a straight line. Throw a ball back and forth with a partner.	10 times on each leg.
6. Forward bend in single-leg stance	As for Exercise 5, but before throwing the ball back, touch it to the ground without putting weight on it. Always keep knee slightly bent and don't let it buckle inwards.	10 throws on each leg.
7. Figures-of-eight in single-leg stance	As for Exercise 5 but before throwing it back, swing the ball in a figure-of-eight through and around the legs: first around the supporting leg with the upper body leaning forward, and then around the other leg standing as upright as possible. Always keep knee slightly bent and don't let it buckle inwards.	10 throws on each leg.
8. Jumps over a line	Jump with both feet, sideways over a line and back, as quickly as possible. Land softly on the balls of both feet with slightly bent knees. Don't let knees buckle inwards.	Repeat side-side 10 times and then forwards-backwards 10 times.
9. Zigzag shuffle	In standing, bend knees and hips so upper body leans substantially forward. Shuffle sideways through the Zigzag course as fast as possible. One shoulder should always point in the direction of movement. Always take off and land on the balls of the feet. Don't let knees buckle inwards.	Complete course twice.
10. Bounding	Bound forward, bringing the knee of the trailing leg up as high as possible and bend the opposite arm in front of the body when bounding. Land softly on the ball of the foot with a slightly bent knee. Don't let knee buckle inwards during take-off or landing.	Cover 30 metres twice.

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