

PREVENTION OF SOCCER-RELATED ANKLE INJURIES IN YOUTH AMATEUR PLAYERS: A RANDOMIZED CONTROLLED TRIAL

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(Received 20 December 2015; accepted 23 January 2017)

Abstract

Background: In lower levels of play, the lateral ankle sprain is the most common injury, especially amongst male youth soccer players. Purpose: The aim of the present study is to evaluate the effects of an injury prevention program on the incidence of ankle injuries in male youth amateur players. **Study Design:** Randomised controlled trial study. **Methods:** Fifty boys (mean \pm SD: age 13.3 \pm 0.4 yr; body mass index of 20.9 \pm 1.5 kg/m²; stature: 1.6 \pm 0.1 m) from two-sport schools, with 4.4 \pm 0.5 years playing experience, participated. Players were randomly assigned to either an experimental (EXP, n = 25) or a control (CON, n = 25) group. A physical exercise program designed exclusively for youth male soccer players to educate as well as increasing the awareness of the risk of injury of athletes and coaches. Over one year, all injuries were documented monthly by physiotherapists. Complete monthly injury reports were available for 50 players. **Results:** Nine ankle injuries occurred in the EXP group, and 20 injuries occurred in the CON group, corresponding to incidence rates of 0.96 and 2.16, respectively, per 1000 player hours, which equates to 55% fewer injuries in the EXP group. **Conclusions:** The incidence of ankle injuries among youth male soccer players can be reduced by the implementation of a multifaceted, soccer-specific physical exercise program. Coaches and players need better education regarding injury prevention strategies and should include such interventions as part of their regular training.

Keywords: Ankle injuries, injury risk, physical exercise, soccer players

Introduction

Soccer is the most popular sport in the world and is played by different gender and age with varying levels of expertise. According to Koutures and Gregory (2010) "participation in soccer is an effective way for children to increase their level of physical activity and fitness because it requires intensive physical effort over an extended period of time through practice and games".

However, similar to most sports, soccer is associated with a certain risk of injury for players both at the competitive and recreational level (Faude, Robler, & Junge, 2013; van Beijsterveldt et al., 2012; Waldén Atroshi, Magnusson, Wagner, & Hägglund, 2012). Soccer injuries are driven by several factors, such as, physical and the lack and/or improper physical preparation, as well as the violence and harsh playing style of opponents and other factors that include the lack of awareness on injury prevention (Engebretsen, Myklebust, Holme, Engebretsen, & Bahr, 2008).

D'Hooghe et al. 2013 stated that epidemiology studies on the occurrence rates of soccer injuries among young players are relatively rare and difficult to compare. The significant incidence of injury among children is at an alarming stage (Spinks & McClure, 2007). The frequency of soccer injuries among youth male players is estimated to be 1.2 to 4.7 per 1,000 hours of exposure during a season (Brito et al., 2012).

Leininger, Knox, and Comstock (2007) reported that the injury rate with regard to age in soccer-related injuries is 0.4% among children 2 to 4 years of age, 12.3% among 5 to 9 years old, 49.0% among 10 to 14 years old, and 38.4% among 15 to 18 years old. The most commonly injured body regions are the lower (47.3%) and upper (30.8%) extremities. The most commonly injured body parts are the wrist, finger, or hand (20.3%), the ankle (18.2%), and the knee (11.4%) whilst the most common diagnoses are sprain or strain (35.9%), contusion or abrasion (24.1%), and fractures (23.2%).

The effect of an injury on a child may be more serious than that of an adult, because it may lead to physical impairment and disability that may further impede their growth. Young players are vulnerable to physical injury because of their immature musculoskeletal structures that render them vulnerable to a range of hard- and soft-tissue injuries (Carson, Woolridge, Colletti, & Kilgore, 2006; Frank, Jarit, Bravman, & Rosen, 2007).

Undoubtedly, injuries in young soccer players normally occur as a result of physical contacts (Koutures & Gregory, 2010). In addition, young players may be attracted to participate in a training program that is suitable only for mature athletes, without knowing whether the intensity of the training is appropriate for their age (Soligard et al., 2010). Moreover, as children, they may lack seriousness, and they may tend to perform only the basic stretching and typical soccer skills such as passing, dribbling, and shooting. Therefore, variations in training programs may predispose young players to danger or physical injuries mainly because of ineffective training methods.

However, assessing the best prevention strategies for a sport or recreational injury requires a full understanding of the factors that contribute to both the occurrence and uptake of these injuries or compliance with potential prevention strategies (Olsen et al., 2004). In fact, prevention strategies can be in the form of education and awareness-raising activities for participants, parents, coaches, or the community as a whole (MacKay et al., 2004).

Consequently, prevention of sports injuries in general and soccer injuries, in particular, should be given high priority. Young soccer players must be provided with safe and effective training programs without over training them while participating in sport activities. In addition, young players require informative knowledge on strategies to prevent or reduce the risk of injury during games and undergoing training.

Methods

Participants

A total of fifty-five male juvenile soccer players from two sports schools were randomised to an experimental (EXP, $n = 25$) group and a control (CON, $n = 25$) groups. These players were followed, during two outdoor seasons players from March 2012 to May 2013. Each school regularly sent complete data on players' injuries and exposure times, both in match play and training (playing hours). Participants were included in the data analysis only for players who completed at least 91% attendance in the study. Players who sustained injuries during the study were also excluded from this data analysis. Based on this criteria and injuries occurred, five players were excluded.

The final sample of participants was 50 players, who had a mean age of 13.34 ± 0.47 years old; weight (kg) 53.54 ± 6.64 ; height 161.21 ± 0.08 cm; a BMI of 20.96 ± 1.57 kg/m², with 4.46 ± 0.57 years playing experience. Participants and parental consent were completed, and all participants were interviewed at baseline to obtain the demographic characteristics, and health history using a checklist of a medical questionnaire.

The exercise training program

The training was designed as a warm-up program exclusively for junior soccer players. The exercises were adapted from various recommendations for training soccer-specific physical performance as part of the warm-up session before each soccer-specific training (Emery, Rose, Meeuwisse, & McAllister, 2007; Hoskins & Pollard, 2010). The exercises focus on core stabilisation, eccentric training of thigh muscles, proprioceptive training, dynamic stabilisation and plyometrics.

The exercise session took 15-20 minutes per session (5 times/week) for 12 weeks, to complete and was meant to be used by children and adolescents from the ages of 13-14. The program includes eighteen different exercises. Fifteen of them single exercise and three corresponding pair exercises. The pair exercises are used as a means of making the training more varied and fun (Farhan, Justine, & Mahammed, 2013). The CON continued their regular soccer-based training regime (5 times/week) for 12 weeks, with no additional warm-up training.

Calculation of injury rates

The rates of injury were calculated per 1000 player hours of exposure time (sum of practice and match exposure in player hours), per player as well as per year. In addition, to analyze the effects of the injury prevention program in more details, two additional indicators were computed: 1) The time spent in practice (in hours) in relation to the number of practice injuries, and 2) The time spent in matches (in hours), in relation to the number of match injuries.

Statistical Analysis

The data collected were subjected to statistical analysis via a software package (SPSS v19, Chicago, US). Descriptive data are presented as means values with SDs, and for categorical data, frequency tables were used. For the calculation of data injury rates differences, the following formula was used: Incidence Rate = (number of injuries/sum of practice and match exposure of player hour's \times 1000) (Knowles et al., 2006). Differences between groups were examined by using independent *t*-tests. The significance level was set at $P \leq 0.05$.

Results

No significant differences were seen between the CON and the EXP groups at baseline characteristics (Table 1). Nine ankle injuries occurred in the experimental group, and 21 injuries occurred in the control group, corresponding to an injury rate of 0.96 and 2.16, respectively, per 1000 player hours, which equates to 55% fewer injuries in the experimental group (Table 2). The injury rates per 1000 hours of exposure time were significantly increased in the CON group than in the EXP group $p < 0.05$ (Figure 1).

Table 1: Comparison of Baseline Characteristics of the EXP and CON Groups

Characteristics	EXP (n = 25)	CON (n = 25)	P-value
Age (yrs)	13.32 \pm 0.47	13.36 \pm 0.49	0.77 NS
Weight (kg)	52.63 \pm 6.72	54.43 \pm 6.55	0.34 NS
Height (cm)	161.27 \pm 0.08	162.01 \pm 0.07	0.99 NS
BMI (kg/m ²)	21.38 \pm 1.53	20.53 \pm 1.61	0.06 NS
Soccer experience (yrs)	4.44 \pm 0.58	4.48 \pm 0.59	0.81 NS

NS (non-significant): $p > 0.05$;

Data are presented as mean \pm SD.

Legend: EXP = experimental; CON = control.

Table 2: Comparison of Incidence of Injury and Exposure Time, per Year between the EXP and CON Groups

Variable	EXP (n = 25)	CON (n = 25)
Injured player	9* (m ±SD)	20 (m ±SD)
Practice hours	133.95 ± 6.20	133.12 ± 8.07
Match hours	52.65 ± 3.54	52.02 ± 3.63
Ankle injury	0.18 ± 0.38	0.40 ± 0.50
	Injuries in relation to exposure time (in hours)	
Total injuries per 1000 h of exposure time	0.96 *	2.16

Legend: EXP = experimental; CON= control.

* Indicates significance of difference between the EXP and CON groups (p < 0.05).

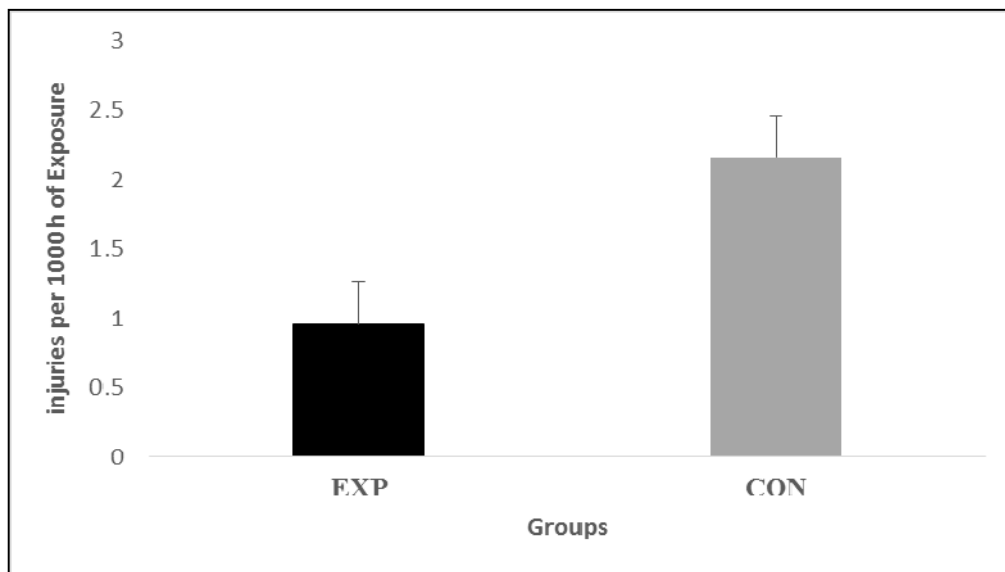


Figure 1: Comparison of Incidence of Injury between the EXP and CON Groups

Discussion

The findings on the incidence of injury in this study indicated a statistical significance difference between the intervention and control groups. The incidence of injury per 1,000 hours of training and playing soccer resulted in 55% fewer injuries in the intervention group compared with the control group. This outcome was in agreement with results observed in the previous study conducted among male and female high school soccer and basketball players and resulted in 38% fewer injuries in the intervention group (McGuine & Keene, 2006). This result was attributed to the high frequency of training (five sessions per week for 12 weeks) of the intervention used in this study and a considerable emphasis on various explosive exercises.

The results of this study obviously indicated that the injury rates in children soccer players could be reduced by the prevention exercise training programme. The greatest effects of prevention exercises in injury rates were observed for mild injuries, moderate injuries, and injuries occurred during practices than the injury rates in matches. Most of the physical interventions of previous studies were designed at improving the structure and content of the practice, and these interventions might have directly reduced practice and overuse injuries.

In fact, match injuries among soccer players are more difficult to prevent, because the reason incurred are predominantly caused by contact with another player on the field (Bahr & Holme, 2003). The high overall compliance with the intervention group indicated that significant contamination between groups was unlikely to

have occurred. Previous studies reported that the main challenge is to encourage players in the intervention group to follow preventive training programs, and not keeping other players from training (Junge, 2000).

Heidt, Sweeterman, Carlonas, Traub, and Tekulve (2000) evaluated a pre-season conditioning program in a randomised controlled trial study with 300 female soccer players. They found that the frequency of injuries during practice in the intervention was lower (2.4%) especially for ACL injuries compared with the control group (3.1%). However, the analysis of time spent in the matches in relation to match injuries in the current study showed that six months after the prevention program, the players in the experimental group had injury rate 0.96, whereas the post-six-month difference was as high as 2.16 injury rate among players in the control group.

This result might be attributed to the different initial conditions in the experimental and control groups. The rates of injury among the players in the control group, especially ligament injuries and practice injuries, were higher in the post-six-month than in the pre-six-month intervention. Other studies that examined the issue of skill level have inconsistent findings, although the results of the present study were consistent with those of Hoskins, Pollard, and Orchard, (2006) and Junge, Rosch, Peterson, Graf-Baumann, and Dvorak, (2002) regarding the incidence of all injuries, and with those of Emery et al. (2007) and Hoskins and Pollard (2010) concerning the incidence of injuries during practice. The players in the control group have a high incidence of soccer injuries because they may have inferior physical performance capacity as reported in Farhan et al. (2013).

Furthermore, the high injury rates, especially during practice may indicate improper structure of the exercises. Hence, the training program applied in the control group was concentrated primarily on training methods and on increasing the physical fitness of the players. As a result of the prevention training program, the injury rates in the experimental group were 55% less than the control group. The findings of this study further suggest that prevention of injury, especially during matches may be possible. The rate of ankle injuries in children male soccer players can be reduced by implementation of soccer-specific prevention training programme.

Conclusions

The findings of this study show that the prevention training programme included jumping, eccentric strength, agility, balance, dynamic stretching and speed was effective in reducing ankle soccer injuries by 55%, especially in children soccer players aged 13 to 14 years. Therefore, football coaches, physical education teachers, fitness trainer, as well as physiotherapists, may be in the best position to use this prevention training programme for children soccer players, to be included in their sport-related activities.

Recommendations

The findings of this study may be useful for young soccer players at the grassroots level. The exercises training can be incorporated in the preparation program and the pre-participation screening of players to ensure the absence of risk factors contributing to injury. In addition, soccer players can be screened for their level of physical fitness to identify their weaknesses and hence be targeted in the enhancement training.

Acknowledgements

This study was funded by a grant from the Research Management Institute, Universiti Teknologi MARA (600-RMI/DANA 5/3/RIF (765/2012). We acknowledge all assistants for test supervision, coaches, and players from sports schools; Kuala Lumpur and Shah Alam in Malaysia, for their cooperation. We also acknowledge the physiotherapy department of the Faculty of Health Sciences, Universiti Teknologi MARA for their materials supports.

Conflict of interest: None

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