



Postural stability and ankle sprain history in athletes compared to uninjured controls



Arnold Huurnink^{a,*}, Duncan P. Fransz^a, Idsart Kingma^a, Evert A.L.M. Verhagen^b, Jaap H. van Dieën^a

^a Research Institute MOVE, Faculty of Human Movement Sciences, VU University, Amsterdam, The Netherlands

^b EMGO Institute, VU University Medical Center, Amsterdam, The Netherlands

ARTICLE INFO

Article history:

Received 29 March 2013

Accepted 18 November 2013

Keywords:

Biomechanics
Postural control
Case-control
Inversion trauma

ABSTRACT

Background: Diminished postural stability is a risk factor for ankle sprain occurrence and ankle sprains result in impaired postural stability. To date, ankle sprain history has not been taken into account as a determinant of postural stability, while it could possibly specify subgroups of interest.

Methods: Postural stability was compared between 18 field hockey athletes who had recovered from an ankle sprain (mean (SD): 3.6 (1.5) months post-injury), and 16 uninjured controls. Force plate and kinematics parameters were calculated during single-leg standing: mean center of pressure speed, mean absolute horizontal ground reaction force, mean absolute ankle angular velocity, and mean absolute hip angular velocity. Additionally, cluster analysis was applied to the 'injured' participants, and the cluster with diminished postural stability was compared to the other participants with respect to ankle sprain history.

Findings: MANCOVA showed no significant difference between groups in postural stability ($P = 0.68$). A self-reported history of an (partial) ankle ligament rupture was typically present in the cluster with diminished postural stability. Subsequently, a 'preceding rupture' was added as a factor in the MANCOVA, which showed a significant association between diminished postural stability and a 'preceding rupture' ($P = 0.01$), for all four individual parameters ($P: 0.001-0.029$; Cohen's $d: 0.96-2.23$).

Interpretation: Diminished postural stability is not apparent in all previously injured athletes. However, our analysis suggests that an (mild) ankle sprain with a preceding severe ankle sprain is associated with impaired balance ability. Therefore, sensorimotor training may be emphasized in this particular group and caution is warranted in return to play decisions.

© 2013 Elsevier Ltd. All rights reserved.

1. Introduction

Ankle sprains are the most common injuries in sports, and can lead to a decreased ability to participate in sports and to a decreased quality of life (Janssen et al., 2011). In addition, an ankle sprain can become chronic with symptoms of pain, recurring sprains and a subjective feeling of instability, also referred to as chronic ankle instability (CAI), which may eventually cause ankle osteoarthritis (Anandacoomarasamy and Barnsley, 2005; Harrington, 1979). Despite a substantial body of research, the etiology of ankle sprains and chronic ankle instability is not yet elucidated. However, evidence suggests the existence of a relation between postural stability (throughout this paper this refers to static single-leg stance on a force plate) and ankle sprain risk. Recently, a meta-analysis showed that decreased postural stability is prospectively related to first-time ankle sprain incidence (Witchalls et al., 2012). Additionally, an earlier meta-analysis provided evidence that diminished postural stability is also prospectively related to overall ankle sprain incidence (first-time and recurrent sprains

pooled) (de Noronha et al., 2006). It should be noted that postural stability is considered to be a reflection of total body sensorimotor function (Witchalls et al., 2012). As various sensory modalities are used to apply feedback corrections around multiple joints (Hof, 2007; Tropp and Odenrick, 1988), it is difficult to pinpoint specific factors leading to both diminished postural stability and increased risk of ankle sprains.

It is also clear that an ankle sprain could lead to diminished postural stability. During the acute phase (<6 weeks) of an ankle sprain, the postural stability in the injured leg is impaired compared to the non-injured leg (Holme et al., 1999; Leanderson et al., 1996). This may be due to a combination of pathology of ankle structures (ligaments, joint capsule, cartilage, tendons and nerves), inactivity of the affected leg, and/or an arthrogenic muscle response due to pain, damage and edema (Palmieri et al., 2004; Tourné et al., 2010; Yammine and Fathi, 2011). Furthermore, a diminished postural stability has been found in individuals with CAI (Arnold et al., 2009; Wikstrom et al., 2010a), and also in ballet dancers recovered from an ankle sprain in the past year (Lin et al., 2011). The latter finding still needs confirmation for athletes other than dancers, but it could explain the marked increase in incidence during the first 6 months post-injury (Verhagen et al., 2004), as well as the decrease in recurrence risk when sensorimotor training is applied to 'recovered' individuals (Verhagen and Bay, 2010). Previously, De Vries et al. (2010b) have

* Corresponding author at: Research Institute MOVE, Faculty of Human Movement Sciences, VU University, Van der Boerhorststraat 9, 1081 BT Amsterdam, The Netherlands.
E-mail address: a.huurnink@gmail.com (A. Huurnink).

shown that postural stability lacks sensitivity for clinical management of ankle sprains when variables such as age, sport type, sport level, length and weight are not controlled for. Therefore, a study in a more strictly defined population of previously injured athletes and matched controls is needed.

Additionally, details of the ankle sprain history may be of importance with regard to the recurrence risk and postural stability. To date, ankle sprain history has not been taken into account in studies on postural stability after ankle sprain injury. As such, a more comprehensive evaluation could indicate specific factors of importance or could specify sub-groups in terms of recurrence risk and treatment required.

Therefore, the aim of the present study was (1) to compare postural stability between field hockey athletes with a previous ankle sprain – within 6 months, fully recovered and returned to their pre-injury level of sports participation – and uninjured controls. Furthermore, (2) we aimed to identify characteristics of ankle sprain history present in a sub-group of ‘recovered’ athletes with strongly affected postural stability.

2. Methods

2.1. Participant recruitment

2.1.1. Inclusion

The age cut-off for entry was 16 to 35 years. As sport type and competition level are confounders of single-leg stance postural stability (Guillou et al., 2007; Kiers et al., 2013; Paillard et al., 2006), all participants were included from one sport type (i.e. field hockey) and had to perform at either inter-district or national level of the official competition. We contacted 26 field hockey teams for recruiting purposes. All coaches of these teams, in consultation with their physical therapist, provided contact information of those players who had endured an ankle sprain in the first 6 months of the season. Subsequently, the researchers contacted these players.

Players who had sustained a self-reported lateral ankle sprain in the past 1 to 6 months, which resulted in at least 2 days off work or 2 missed sport sessions, were eligible for inclusion in the ‘previously injured’ group. Any form of therapy had to be finished, and a full return to pre-injury sport level participation had to be achieved at the time of inclusion. Players who did not suffer from an ankle sprain in the past five years were eligible for inclusion in the ‘uninjured’ group. Written informed consent was obtained once the purpose, nature and potential risks had been explained to the volunteers. The study was performed according to the Declaration of Helsinki and approved by the Human Ethics Committee of the Faculty of Human Movement Sciences of the VU University Amsterdam.

2.1.2. Exclusion

The volunteers were screened for the following exclusion criteria: (a history of) musculoskeletal injuries (other than ankle sprain), any other disease that may affect balance performance, head injury in the previous 6 months, and any use of medication that would affect balance.

2.1.3. Power

A minimal effect size of 1 standard deviation was considered to be clinically relevant. Consequently, a minimum of 16 participants in each group was considered sufficient.

2.1.4. Participants

Eighteen participants were included in the ‘previously injured’ (ankle sprain) group, as illustrated by the inclusion–exclusion flow chart (Fig. 1). The timing of measurement was mean 3.6 (SD 1.5) months post-injury. Sixteen participants were included in the ‘uninjured’ group. Table 1 outlines the demographic and ankle sprain characteristics. With regard to ankle sprain severity, if a participant went to see a (allied) medical practitioner, the diagnosis made was adopted. If no medical care was sought, a mild sprain (grade I) was assumed, after verification that

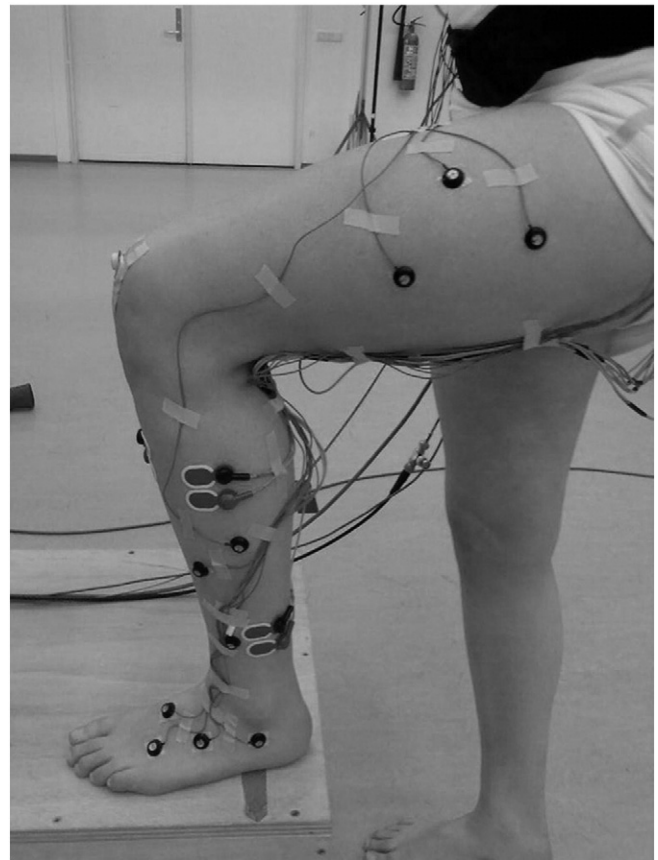


Fig. 1. Typical example of the LED positioning on the foot (4 LEDs), thigh (3 LEDs) and shank (3 LEDs).

these participants had been able to walk within 7 days post-injury, and had not noticed any signs of hematoma discoloration (van Dijk, 2002).

2.2. Experimental task

Participants were asked to perform three valid single-leg stance trials of 20 s with the eyes open for each leg. Participants had to stand as still as possible and keep their hands on their hips. A trial was considered invalid if a participant displaced his/her standing leg, touched the

Table 1
Demographic and ankle sprain characteristics.

	Uninjured	Injured ^a
Men (n)	8	10
Women (n)	8	8
Age (years) ^b	19.1 (2.0)	20.7 (4.4)
Length (m) ^b	1.75 (0.09)	1.80 (0.09)
Weight (kg) ^b	66.9 (9.1)	74.6 (12.5)
Experience (years) ^b	12.4 (2.8)	13.5 (4.5)
Balance therapy past year (%)	0	39
Brace/tape past year (%)	0	72
Preceding (partial) rupture (%)	0	39
>5 sprains past 5 years (%)	0	17
3–5 sprains past 5 years (%)	0	39
1–2 sprains past 5 years (%)	0	44
Bilateral sprains past 2 years (%)	0	39
Medical care (%) ^c	NA	39
Grade II/III sprain (%) ^c	NA	22
Right leg affected (%) ^c	NA	39

^a Recent ankle sprain past 6 months.

^b Mean (SD).

^c With regard to recent ankle sprain.

Download English Version:

<https://daneshyari.com/en/article/6205021>

Download Persian Version:

<https://daneshyari.com/article/6205021>

[Daneshyari.com](https://daneshyari.com)